संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

(FACULTY OF ENGINEERING & TECHNOLOGY)

PROSPECTUS

Prescribed for
Four Year Degree Course
Bachelor of Engineering
Electrical and Electronics Engineering
Fifth & Sixth Semester
Examinations, 2011-2012 and
Seventh & Eighth Semester Examinations,
2012-2013
Semester Pattern

2011

Price Rs.10/-

www.sgbau.ac.in

SYLLABUS
PRESCRIBED FOR
FOUR YEAE B.E. DEGREE COURSE IN
ELECTRICAL AND ELECTRONICS
ENGINEERING
SEMESTER PATTERN
FIFTH & SIXTH SEMESTER

SEMESTER : FIFTH

5SEE01   **INDUSTRIAL ORGANISATION**

Unit I :   **Organisation :** Concept of organisation, characteristics of organisation, elements of organisation, organisational structure, organisation charts, Types of organisation- formal line, military or scalar organisation, functional organisation, line & staff organisation, project organisation, matrix organisation, authority and responsibility, span of control, delegation of authority. Industrial ownership: Types of ownership- single ownership, partnership, joint stock company, co-operative societies, public sector, private sector, scientific management- review of different schools of thoughts.

Unit II: **Personal Management:** Recruitment and training, labour turnover, operator training, suggestion systems. Industrial safety: working conditions, environmental factors, psychological attitude to work and working conditions, fatigue, accidents and hazards. Wages and Incentives: feature of wages, time and piece rate, different incentive plans, profit sharing, job evaluation and merit rating, factors of comparison and point rating.

Unit III: Industrial relations: Fatigue-Communication in industry-Industrial disputes- Trade unions-Quality circles-BIS-ISO-Labour welfare-Industrial safety-Statutory provisions in labour legislations. Ergonomics: Objectives and applications

Unit IV :   **Marketing Management:** Concept of marketing VS sales approach, consumer behaviour and demand concept, buying motives, influence of income level, product design, new product distribution, pricing decisions, major price policy considerations, pricing methods and tools, break even analysis and marginal costing in pricing, sales promotion, marketing research, test marketing, marketing of services, advertising management- types of advertising, choice of media, economic and psychological factors in advertising.

Unit V :   **Finance Management :** Tasks, evolution of corporate

management, long term financing, equity, preference and debenture capitals, term loans, dividends and share valuation, legal aspects of dividends, short term financing, working capital influencing factors, cash budgeting, terms of liquidity, management of receivable and inventories, budgets and budgetary control-objectives of budgeting, classification, ratio analysis.

Unit VI :   **Management accounting:** Fundamentals of book keeping, journalising, ledger accounts, subdivision of journal, cash book, banking transactions, trial balance, preparation of trading, profit and loss account, and balance sheet, adjustments.

REFERENCES

1.   Industrial Organisation and Management : Bethel et.al, McGraw Hill
2.   Principles of Industrial Management : Kootnz & Donnel
3.   Financial Management : Prasanna Chandra, Tata McGraw Hill
4.   Operation Management : Fabricky et al, Tata McGraw Hill
5.   Hand Book of MBO : Reddin & Ryan, Tata McGraw Hill.
6.   Industrial finance of India : SK Basu
7.   First steps in book keeping : J B Batliboi
8.   Management accounting : Hingrani & Bemnath.
9.   Industrial Engg & Management - O.P.Khanna.

5SEE02   **CONTROL SYSTEMS**
SECTION-A

Unit I :   **Introduction to automatic control :** open loop and closed loop system, servo-mechanisms, mathematical modeling of physical systems, transfer functionis, block diagrams and signal flow graphs.
Effect of feed back on sensitivity to parameter variation and reduction of the noise.

Unit II :   **Control System Components :** Electrical / Electro-mechanical components such as A.C./D.C. servomotors, stepper motors, synchors, potentiometers, tachogenerators, their functional analysis and operating characteristics and their application. Pneumatic controls devices.

Unit III: **Time response analysis :** time response of first and second order systems to standard inputs. Time response specifications, types of system, error analysis, error coefficients, steady state errors, dynamic error series.
Approximate methods for higher order system, proportional, derivative and integral control.

SECTION-B

Unit IV: **Stability :** stability of control systems, characteristics equation, impulse response, Routh-Hurwitz stability criterion, relative stability.

Root Locus : construction of root locus, determination of roots from root locus conditions on variable parameter for stability, effect of addition of poles and zeros.

Unit V : **Frequency response methods :** frequency response of linear system, specification, Logarithmic frequency response (Bode) plots from transfer function for various systems. Polar plots for various systems. Estimation of approximate transfer function from the frequency response., Stability analysis from Bode plots. Nyquist criterion, Nyquist plots and stability analysis

Unit VI : **State, state space and state variables;** SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model; Transfer matrix; State equations solution - State transition matrix (STM); STM Computation – Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response – SISO Systems. Concept - controllability and observability, Kalman & Gilbert test

TEXT BOOKS :

1. Control Engineering, D.Ganesh Rao, k.Chennavenkatesh, 2010
2. Modern Control System, Richard Dorf, Robert Bishop, 11th edition2008
3 Nagrath I.J., Gopal M. : Control System Engineering, Wiley Eastern.'
4. Ogata K. : Modern Control Systems, Prentice Hall of India.
5. Control System Engineering, R Anandanatarajan, P Ramesh Babu,SCITECH Publications, Chennai, 2nd edition,2010

PRACTICALS : Minimum 10 No. of experiments are to be performed, based on above syllabus.

5SEE03   **ELECTRICAL MACHINES II**

SECTION-A

Unit I : Fundamentals of AC rotating machines. AC windings- integral slot, fractional slot and fractional pitch windings- distribution factor, pitch factor and winding factor-harmonic mmf of distributed windings, EMF equation.

Unit II : **Synchronous Generators :** constructional details, armature reaction-circuit models and phasor diagram of salient and non salient pole machines - determinations of parameters of the circuit models - methods of determining regulations and efficiency, transient and subtransient reactances.

Unit III : **A) Synchronous Motors :** principle of operation - torque equation - circle diagrams- V-curves - hunting and damping starting applications.

B) Methods of synchronization - synchronous machine on infinite busbars - parallel operation of generators.Introduction to conducting and reporting the test on synchronous machine as per IS.

SECTION – B

Unit IV : **Three phase induction motor :** rotating magnetic fields, principles of operation-constructional details - circuit models and phasor diagram, performance equations direct and indirect testing-circle diagram.

Unit V : Methods of starting and speed control of 3 phase IM-double cage motor-methods of braking-single phasing, cogging and crawling, scharge motor.

Unit VI: A) Single phase IM : different types - starting methods - characteristics and applications.

B) AC commutator machines-series motors - characteristics and applications.

C) Small machines-principle of operation, construction characteristics and applications of Printed Circuit Motor (PCM), Syn, ind motor, reluctance motor and hysterisis. Introduction to conducting and reporting the test on single phase induction motor as per IS.

TEXT BOOKS :

1. Theory of AC Machines : A.S.Langsdorf (McGraw Hill)
2. Performance and Design of AC Commutator Motors - Openshov - Taylor (McGraw Hill)
3. Performance and Design of Alternating Current Machines : M.C.Say,
4. Electrical Machines - Nagrath, Kothari. (Tata McGraw Hill)
5. Latest Indian Standard guide for testing synchronous machine and single phase induction motor.

PRACTICALS :-At least Ten experiments based on the above syllabus.

5SEE04   **DIGITAL ELECTRONICS**

Unit-I   Definitions for Digital Signals, Digital Waveforms, Digital Logic, Moving and Storing Digital information, Digital Operations, The Basic Gates—NOT, OR, AND, Universal Logic Gates—NOR, NAND AND-OR-Invert GATES, Positive and Negative Logic.

Unit-II   **Combinational Logic circuits:** Boolean Laws And Theorems,Sum-of-products Method, Truth Table to Karnaugh Map,Pairs, Quads, and Octets, Karnaugh Simplifications Don't-care Conditions, Product-of-sums Method , Productof- sums Simplification, Simplification by Quine-McClusky Method, Hazards and Hazard Covers.

Unit-III   **Data-processing circuits:** Multiplexers, Demultiplexers, 1- of- 16 Decoder, BCD-to-decimal Decoders Seven-segment Decoders,Encoders, Exclusive-or GATES, Parity Generators and Checkers ,Magnitude comparator, Read-only Memory .

Unit-IV   :   Number systems and codes: Binary Number System, Binaryto- decimal Conversion , Decimal-to-binary Conversion, Octal Numbers, Hexadecimal Numbers , The ASCII Code, The Excess-3 Code, The Gray Code. Unsigned Binary Numbers, Sign-magnitude Numbers, 2'S Complement Representation.

Unit-V   :   **Arithmetic circuits:** Binary Addition, Binary Subtraction, 2'S Complement Arithmetic , Arithmetic Building Blocks, The Adder-subtracter , Fast Adder, Arithmetic Logic Unit , Binary Multiplication & Division.

Unit-VI   :   **Clocks and Timers:** Clock Waveforms, TTL Clock, Schmitt Trigger. Flip-Flops: RS Flip-flops, Gated Flip-flops, Edgetriggered RS Flip-flops , Edge-triggered *D* Flip-flops , Edgetriggered *JK* Flip-flops , Flip-flop Timing, *JK* Master- slave Flip-flops, Analysis of Sequential Circuits.

Text-Book :

Donald P Leach, Albert Paul Malvino,Goutam Saha, "Digital Principles & Applications" (6/e) (McGraw-Hill).

Reference books:

1.   Mano M. & Kime "Logic & Computer Design Fundamentals" (2/e) (Pearson Education).
2.   Taub & Schilling " Digital Integrated Electronics" (TMH).
3.   Jain R.P. "Modern Digital Electronics" (TMH).
4.   Mano M. & Kime "Logic & Computer Design Fundamentals" (2/e) (Pearson Education).
5.   M.Morris Mano "Digtal Design" (2/e) (PHI).

5SEE05   **ELECTRICAL POWER I**
                              SECTION-A

Unit I :   **Transmission line parameters :** calculation of resistance, inductance and capacitance of single phase and three phase transmission lines, skin effect and proximity effect, transposition, G.M.D. & G.M.R. methods, double circuit lines, bundled conductors, effect of earth on inductance and capacitance, interference with communication lines. (10)

Unit II :   **Electrical characteristics of transmission line :** V-I characteristics of short, medium and long lines, A, B, C, D constants, nominal TI and equivalent T representations, Ferranti effect, corona phenomenon, effect of corona and power loss due to corona.

                  Representation of power systems : per unit system and one- line reactance diagrams.   (10)

Unit III :   **Voltage control and power factor improvement :** receiving and sending end power circle diagrams, methods of voltage control and power factor improvement, use of static VAR generators and synchronous phase modifiers, analytical and graphical methods, automatic voltage control.   (10)

                              SECTION-B

Unit IV :   **Load flow studies :** load flow problem, classification of buses, network modeling, Y-bus and Z-bus matrices, load flow equation, Gs and NR methods, comparison of methods used.
                                                             (10)

Unit V :   **Mechanical design :** materials used, types of insulators, comparison of pin type and suspension type insulators, voltage distribution and string efficiency, methods of increasing string efficiency, grading rings and arcing horns. Introduction to insulator testing, line supports for LV, HV and EHV, Sag calculation, stringing charts.

Unit VI :   **Underground cables :** material used for conductor & insulation : different types of cables and their manufacture, parameters of underground cable, grading of cable losses, break down and rating, testing of cables.

Text Books :-

1.   Power System Analysis, N.V.Ramana, Pearson education, 2010
2.   Power System Analysis, Arthur R. Bergen, Vijay Vittal,2nd Edition, 2009, PEARSON Education
3.   I. J. Nagrath & D. P. Kothari – "Modern Power System Analysis", Tata- Mc-Graw Hill Publishing Company, New Delhi.

Reference Books :-

1. S. Rao – "EHV A.C. and HVDC Transmission Engineering and Practice", Khanna Publishers, New Delhi.
2. Narain G. Hingorani and Lazlo Gyugyi – "Unerstanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.
3. Yong Hua Song and Allan T. Johns - "Flexible AC transmission Systems (FACTS), T and D reference book" Westing house.

5SEE06   COMMUNICATION SKILLS

Unit I   : Comprehension over an unseen passage. Comprehension – A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage. Comprehension - B - Structure study :-Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could,would, too etc. Active and passive forms, negative and interrogative, punctuation and capitalization.

Unit II   : **Theoretical background -** importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content. Non-verbal communication, types of graphics and pictoral devices.

Unit III   : Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for dayto-day written communication like applications, notices, minutes, quotations, orders, enquiries etc. Oral communications - Important objectives of interpersonal skills, (verbal and non-verbal), face to face communications, group discussion and personal interviews. Methodology of conduction of meetings, seminars, symposia, conference and workshop.

BOOKS RECOMMENDED:

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.
2) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.

3) Raman Sharma "Technical Communication", Oxford University Press..
4) F.Frank Candlin : General English for Technical Students, University of London Press Ltd.

COMMUNICATION SKILLS LABORATORY

Objective :   On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language, actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be assessed through continuous monitoring and evaluation. The sample list of experiments is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter
6. Writing daily diaries and letters
7. Interactive language laboretory experiments.

Text Books : i. Norman Lewis : Word Power Made Easy
http://www.teachingenglish.org.uk   ii. Ghosh: "Technical Communication", Oxford University Press.

SEMESTER : SIXTH
6SEE01   DIGITAL SIGNAL PROCESSING
SECTION - A

UNIT-I   : Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations.

UNIT-II   : Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, DFT and its properties , Circular convolution, Linear convolution from DFT, FFT, decimation in time and frequency algorithm.

UNIT-III   : Sampling of Bandpass signals-Representation of Bandpass signals, sampling of bandpass signals, discrete time processing of continuous time signal; Analog to digital conversion-sample and hold, quantization and coding, analysis of quantization errors, oversampling of A/D

converter; Digital to Analog conversion-sample and hold, first order hold, linear interpolation with delay, oversampling of D/A converter

SECTION-B

UNIT-IV : Filter categories, Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures for F.I.R. filter, Steps in Filter Design, Design by Pole Zero Placements, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window.

UNIT-V : Analog filter types, Butter worth, Elliptic filter, Specification and formulae to decide to filter order, Methods to convert analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation.

UNIT-VI : DSP Processors and applications- DSP Microprocessors architectures, fixed point, floating point precision, algorithm design, mathematical, structure and numerical constraints, DSP programming, filtering, data conversion; Real time processing consideration including interrupts

TEXT BOOKS:

1. Proakis & Monolakis D.G, 'Digital Signal Processing', PHI Publication
2. Oppenhavm & Scheffer, 'Discrete Time Processing', John Wiley Publication
3. Digital Signal Processing, P Ramesh Babu, SCITECH Publications, Chennai, 4th edition, 2010
4. Mitra S.K, 'Digital Signal Processing', TMH Publication

6SEE02   **ELECTRICAL POWER II**
SECTION-A

Unit I : **Symmetrical components**
Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank- sequence voltages and currents relationship; power system elements – sequence impedance and sequence networks ; Various three phase transformer connections – zero sequence rules; Unbalanced load system – application.

Unit II : **Symmetrical Fault Analysis**
Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit III : **Unsymmetrical Fault Analysis**
L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults- loaded and unloaded conditions.

SECTION-B

Unit IV : **Over voltages**
Causes – internal and external; Voltage surge, Basic insulation level, Protection – earthing screen, overhead ground wire, lightning arresters.

Unit V : HVDC Transmission Basic principle, Transmission equipments, Comparison with AC links, Inverters – reactive power requirement; Converters, DC links, Circuit breaking, ground return, Economic distance, modern developments.

Unit VI : **Flexible AC Transmission Systems (FACTS)**
FACTS concept, Elements, Controllers, Comparison with Conventional AC Transmission system.

Text Books :-

1. Power System Analysis, N.V.Ramana, PEARSON education, 2010
2. Power System Analysis, Arthur R. Bergen, Vijay Vittal, 2nd Edition, 2009, PEARSON Education
3. I. J. Nagrath & D. P. Kothari – "Modern Power System Analysis", Tata- Mc-Graw Hill Publishing Company, New Delhi.

Reference Books :-

1. S. Rao – "EHV A.C. and HVDC Transmission Engineering and Practice", Khanna Publishers, New Delhi.
2. Narain G. Hingorani and Lazlo Gyugyi – "Unerstanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.
3. Yong Hua Song and Allan T. Johns - "Flexible AC transmission Systems (FACTS), T and D reference book" Westing house.

Practicals : Minimum eight experiments based on above syllabus, preferably with uniform distribution.

6SEE03   **OPTIMISATION TECHNIQUES**
SECTION-A

Unit I : Introduction, engineering applications of optimization, statement of an optimization problem, optimization techniques, classical optimization problem, optimization techniques. Classical optimization techniques - single and multi variable optimization with and without constraints.

Unit II : Linear programming I - standard form, definitions and theorems, graphical method, solution of system of linear simultaneous equations, simplex method, two phase simplex method, revised simplex method.

Unit III : Linear programming II - duality, theorems on duality, dual simplex method, decomposition principle, sensitivity analysis, balanced and unbalanced transportation problems.

SECTION-B

Unit IV: Non linear programming - unimodal function, unrestricted search, Fibonancci search method and Folden section method, unconstrained optimization, direct search methods - pattern search methods, simplex method, descent method - steepest descent method, conjugate gradient and variable metric method.

Unit V : CPM and PERT introduction - Network representation of project, critical path, optimum scheduling by CPM, crashing of project.

Unit VI: Dynamic programming : multistage decision processes, principle of optimality, sub optimization, calculus and tabular method of solution, conversion of final value problem into initial value problem, solution of linear programming. Continuous dynamic programming.

BOOKS :
1) S.S.Rao : Optimization - Theory & Application, Wiley Eastern Ltd.
2) L.S.Srinath : PERT and CPM Principles & Application, Affiliated East West Pvt. Ltd., New Delhi.

REFERENCE BOOKS :
1) Fredrick S.Hiller Gerald J.L. Lieberman : Introduction Operations Research, Tata McGraw Hill Pub. Co., New Delhi.
2) H.A.Taha : Operations Research, PHI, New Delhi.
3) P.K.Gupta & D.S.Hira : Operations Research, S.Chand & Co. Ltd, New Delhi.
4) J.C.Pant : Introduction to Optimization, Jain Brothers, New Delhi.

6SEE04   MICROPROCESSORS & MICROCONTROLLERS
SECTION-A

Unit I : **8085 :** architecture, register structure, addressing modes, instruction set of 8085, timing diagrams.

Unit II : Assembly Language Programming of 8085, counters and time delays, stack and subroutines, Memory mapped I/O and I/O mapped I/O, address decoding techniques. Interrupt system of 8085 (software and hardware interrupts). Data transfer

schemes, serial data transfer through SOD and SID line.

Unit III : Interfacing devices (I) : internal architecture and programming of PPI (8255), PIC (8259), USART (8251).

SECTION-B

Unit IV : Interfacing devices (II) : architecture and programming of programmable interval timer (8253), floppy disc controller (8272), programmable CRT controller (8275), DMA controller (8237). Introduction to architecture 8086.

Unit V : Microprocessors applications : hardware & software developments : signal conditioning & data acquisation system components. Measurement of pulse width using parallel port, SID lines, interrupts and timer and counter. Magnitude measurement techniques : rectification, sampling etc.

Measurement of fundamental quantities (voltage, current, frequency, speed) and derived quantities   (resistance, inductance, capacitance, phase angle, power factor).

Unit VI : Introduction to microcontroller: 8051 architecture , 8051 Internal resources, pin diagram, I/O pins, ports and their internal logic circuits, counters, serial ports, interrupt structure, SFRs and their addressing, watch-dog timer, internal code memory, data memory, stack pointer, flags, bit addressable memory, comparative study 8051 families by different manufacturers, study of instruction set of 8051.

TEXT BOOKS
1) Microprocessor Architecture, Programming, and Applications with the 8085 , Romesh Gaonkar PHI Publication -2006
2) Introduction to Microprocessor L.Gibson, Prentice-Hall 2003
3) The 8051 Microcontroller Scott MacKenzie Prentice-Hall, Inc -2006

REFERENCE BOOKS
1. An Introduction to Microcomputers Volume 1 Basic Concepts, Adam Osborne Osborne-McGraw Hill, Berkely California, 1980
2. The 8051 Family of Microcontrollers Richard Barnett Prentice-Hall, Inc -2005
3. http://www.nptel.iitm.ac.in/
4. www.ocw.mit.edu

PRACTICALS : Uniformly distributed Minimum 10 practicals based on above syllabus.

6SEE05   **POWER ELECTRONICS I**
SECTION-A

Unit I : SCR, triac, diac-construction, characteristics & applications, two transistor analogy for turning ON-OFF SCR, turn ON mechanism, different methods of turning ON-OFF SCR, turn OFF mechanism, thyristor firing circuits, introduction to GTO, power transistor, power MOSFET & IGBT & their construction & characteristics.

Unit II : Series -parallel operation of SCRs, firing ckts. for series and parallel operation, static & dynamic equalising ckts., equalisation of current in parallel connected SCRs, string efficiency, derating factor, protection of SCRs against di/dt, dv/dt, radio freq. interference, over voltage, over current.

Unit III : Principle of phase control, half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of free wheeling diode, single phase dual converters.
Three phase half controlled bridge and fully controlled bridge rectifier. (only descriptive approach)

SECTION-B

Unit IV : Classification of ckt. for forced commutation, series inverter, improved series inverter, parallel inverter, out put voltage and waveform control, principle of operation for three phase bridge inverter in 120 deg. and 180 deg. mode, single phase transistorised bridge inverter.

Unit V : Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper ckt., Jones chopper, step-up chopper, step-down chopper and AC chopper.
Basic principle of cycloconverters, single phase to single phase cycloconverter, voltage regulators.

Unit VI : Speed control of DC series motors using chopper, speed control of DC shunt motor using phase controlled rectifiers, speed control of three phase induction motor by stator voltage control, v/f control and slip power recovery scheme. Static ckt. braker, UPS, fan speed regulator, principle of soft start ckts. Zero Voltage Switch.

TEXT BOOKS :
1)   M.H.Rashid : Power Electronics Circuits Devices and Application, PEARSON Education., 3rd edition 2004i.
2)   Principles of Popwer Electronics, J.G.Kassakian, M.F.Schlecht G.C.Verghese, PEARSON Education 2010

3)   M.D.Singh & K.B.Khanchandani : Power Electronics, Tata McGraw Hill, New Delhi.

Reference books :
1)   Dr.P.S.Bimbhra : Power Electronics, Khanna Publisher, New Delhi.
2)   P.C.Sen : Power Electronics, TMH Publication Co. Ltd., New Delhi.
3)   H.C.Rai : Industrial and Power Electronics, Umesh Publication, New Delhi.
4)   G.K.Dubey, S.R.Doradia, A.Joshi, R.M.Sinha : Thyristerised Power Controllers, New Age International, New Delhi.
5)   Power Electronics, R.S.Ananda Murthyv. Natarasu, 2nd edition,2010

PRACTICALS : Minimum 8 practicals based on above syllabus, preferably uniformly distributed.

*****

SEMESTER : SEVENTH
7SEE01 UTILISATION OF ELECTRICAL ENERGY
SECTION-A

Unit I : Concept of electrical drive, classification, advantages of electrical drive, selection criterion for electrical motor, size, specification and type of motor, mechanical features of motor, transmission of drive, industrial application, general workshop, Textile mill, Paper mill, Cement mill, Coal mining, Sugar mill, Printing industry.

Unit II: Types of duties, continues, intermittent and short time, heating and colling of motor, rating calculations for these duties, use of fly wheel and fly wheel calculations. Introduction for conducting and reporting the test on induction motors as per Indian standard.

Unit III: Characteristics of DC motors, three-phase induction motors, single-phase induction motors. Quadrantal diagram of speed-torque characteristics of motors, starting methods, different methods of speed control, braking of motors, plugging, rheostatic and regenerative braking.

SECTION -B

Unit IV: Requirement of ideal traction system, system of track electrification and their comparison, speed time curves, energy consumption calculation, calculation of tractive efforts.

Unit V : Traction motors, general features and types, characteristics,

control of locomotive motor coaches, series-parallel control. Overhead equipments, collector gear for overhead equipments.

Unit VI: a) Nature of light-units, luminous efficiency, Glare production of light, Polar curves, control of light by reflection, refraction and diffusion. Lighting calculations, factory lighting, flood lighting, street lighting.

b) Methods of heating and welding furnaces

TEXT BOOKS :

1) E.O.Taylor : Utilization of Electric Energy in SI Units, published by Orient Longman Ltd.

2) S.K.Pillai : A First Course in Electrical Drives, published by New Age International.

REFERENCE BOOKS :

1) Vedam Subrahmanyam : Electric Drives, published by Tata McGraw Hill Publishing Co. Ltd., New Delhi.

2) C.L.Wadhwa : Generation Distribution and Utilization of Electrical Energy, published by New Age International Pvt. Ltd.

3) Specification of Three Phase Induction Motors as per Indian Standard, published by Indian Standard Institute, New Delhi.

4) H.Pratap : Utilization of Electrical Energy.

PRACTICALS : Minimum TEN experiments based on above syllabus

7SEE02 ELECTRONIC COMMUNICATION

Unit I : Signal and Noise : - Audio signals, frequency range speech and music, sound intensity, loudness, level, frequency response, bandwidth, bandwidth requirement for different types of signals such as telegraph, telephone speech, music and video Noise: External and internal noise, noise figure, signal to noise ratio, noise figure measurement.

Unit II: Modulation Techniques : - Amplitude modulation theory, Frequency spectrum representation of AM, Modulation index side bands, power relations, current relations and voltage relation in the AM wave. Frequency modulation and phase modulation, frequency deviation, modulation index, frequency spectrum.

Unit III: AM Transmitters : - Principles of DSB-FC, DSB-SC, SSB-SC modulation and their comparison, Details of DSB-FC transmitter, Generation of DSB-SC by using balanced

modulators (FET & Diodes), DSB-SC transmitter. Generation of SSB-SC by phase-shift method.

Unit IV : AM Receivers : - TRF receiver, superhetrodyne receiver, details of each block such as RF amplifier, Oscillator, IF amplifier, Diode detector, audio amplifier. Mixer: Principle, Need and type of AGC, Practical radio receiver circuit with AGC, characteristics such as selectivity, sensitivity, and fidelity communication receiver.

Unit V : FM Transmitter : - Circuits for direct FM generation using FET and varactor diode. Circuit & analysis of Indirect FM generation, Narrow band and wide band FM, their comparison, de-emphasis and pre-emphasis. FM transmitter & stereo FM transmitter.

Unit VI : FM Receivers :- Details of FM receiver, blocks such as RF amplifier, local oscillator, IF amplifier, Mixer, audio Ampl. AGC, limiter, FM discriminator, single slope and balanced slope detector, analysis of Foster seeley and ratio detectors, stereo FM receiver.

TEXT BOOK :-

1. Kennedy G.: Electronics Communication System, Tata McGraw Hill Co.New Delhi.

REFERENCE BOOKS :-

1. Young P.H.: Electronics Communication Techniques, A Bell and Howell Co. Indiana.

2. Martin James. : Telecommunication and the Computer, Prentice Hall Inc. New Jersey.

3. Roddey D. Coolen S.: Electronics Communication, Prentice Hall India Pvt. Ltd.

4. Beck, Robert and J.Schoen: Electronics Communication, Modulation and Transmission, A Bell and Howell Co.

7SEE03 COMPUTER ORGANISATION

Unit-I: Basic strucutre of computer: Hardware & software.Addressing methods. Program sequencing. concept of memory locations & address. Main memory operation. Instructions & instruction sequencing. Addressing modes. BasicI/O operations. Stacks. Queues & subroutines.

Unit-II: Processing Unit: fundamental concepts. execution of a comlete instruction. hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching,

emulation.

Unit-III: I/O organizatiion: accessing I/O devices,interrupts, direct memory access:bus arbitration. I/O hardware:processor bus and interfacing circuiuts,standard I/O interfaces: SCSI bus, backplane bus standard.

Unit-IV: Memory Unit: basic concepts,semiconductor RAM memories,internal organization, static & dynamic RAMs, ROMs. speed, size & cost considerations.Cache memories: performance considerations. Virtual memories, address translation,memory management requirements.

Unit-V: Arithmetic; number representation. design of fast adders,signed addition and subtraction. Multiplication of positive numbers, Booths' algorithm, Integer division.Floating-point numbers and related operations.

Unit-VI: Computer Peripherals: Input-output devices like video displays, video terminals, graphics input devices, printers.Online storage devices: magnetic disks, magnetic tape systems, CD-ROM systems. Communication devies: Modems.

Text-Book:

V.Carl Hamacher & S. Zaky "Computer Organization" (4/e) McGraw-Hill(ISE).

References:

1. Stallings. W. " Computer Organization & Arcitecture" (5/e) (Pearson Education).
2. Tenanbaum A.S." Structured Computer Organization" (5/e) (Pearson Education).
3. Hayes J.P. "Computer Architecture & Organization' (4/e) (McGraw-Hill).

7SEE04 POWER ELECTRONICS II
SECTION-A

UNIT I **Introduction to Electrical Drives:** Concept, Classification and Advantages. Basic elements, Components of load torque, Torque equation, Equivalent values of drive parameters. Types of mechanical loads. Selection of motor and Controller, Classes of duty, Stability of an electrical drive. Comparison of AC and DC drives.

UNIT II **Starting and Braking of Electrical Drives:** Solid-state starters, soft starting, Calculation of starting/acceleration/ reversal time and energy loss during starting. Types, advantages, limitations and purposes/objectives of electrical

braking, Braking of d c and induction motors.

UNIT III DC Drive Control Basic machine equations, schewe of control, Single phase separately excited drives, single– phase- series motor drives, power factor improvement, Three-phase separately excited drive, Closed loop control, PLL control, microcomputer control.

SECTION-B

UNIT-IV **Ac drive control:** Basic principle of operation, speed control of induction motor, stator voltage control, varible frequency control, Rotor resistance control, slip-power recovery scheme, Synchronus motor drive, Microprocessor controlled AC Drive.

UNIT V Vector controlled Drive,Principle of Vector Control, Equivalent ckt. Direct v.c., Flux vector estimation, Indirect v.c., v.c. of line side pular rectifer exator flux oriented v.c., v.c. of current fed inventer drive & cycloconverter drive servorless control speed estimation controls – EKF method

UNIT-VI Direct torque & adoptaive controlled Drive Torque Expression o& control strategy self tuning control MRAC sliding mode control self commissiong of drive, Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

References:

1. Power Electronics : (Converts, Application & Design) – Mohan/ Undeland/ Rossing- John wiley
2. Power Electronics : M.D. Singh, K.B. Khan Chardalli – TMH
3. Power Electronics : M.H. Rashid – Pearson Education
4. B.K. Bose : Modern Power Electronics and AC Drive, Pearson Education
5 G. K. Dubey Fundamentals of Electrical Drives, , Narosa Publishing House,2005
6 V.Subrahmanyam Electric Drives-Concepts and Applications, TMH Pub,2004

PRACTICALS : Minimum EIGHT experiments based on above syllabus

7SEE05 ELECTIVE I
I PROCESS CONTROL SYSTEMS
SECTION-A

Unit I   :   Electronics Instruments for Measurement of Electrical Parameters Advantages of Electronic Instruments, Electronic Voltmeters Electronic Multimeters, differential volt meter, Digital voltmeter, Q meter, vector impedance meter, vector voltmeter.

Unit II   :   Signal Generation and Analysis
Signal generators, Function generators. Wave analyzer Harmonic Distorsion Analysers, spectrum Analysis.

Unit III   :   Signal Counting and Recording
Decade counting Assembly, Binary counter, Decimal counter, Decade counter with digital disply, universal counter, Digital readot devices, storage type CRO, Servotype X-Y recorder.

SECTION-B

Unit IV   :   Signal conditioning and Conversions.
Frequency characteristics of various types of signals,active filters bandpass,low pass and high pass filters using opAmps. Various techniques od A/D and D/A conversions. Modulation and demodulation PCM techniques, phase locked loop.

Unit V   :   Signal Processing
Pulse times, triggered elayed sweeps, discrete pulse delay circuits, pulses equencing, analog multiplexers and demultiplexers, digital multiplexing sample and hold circuits, serial and parallel digital data conversion. Signal transmission, Analog and digital telemetry techniques, MODEM and UART, keyboard and character generators, tape recorder,

Unit VI   :   Introduction to Processor and Processor based Techniques.
Introduction to PLC, PLC architecture, programming; ladder diagram and examples, micro controller based instrumentation

Text Books: -

1. H.S. Kalsi – Electronic Instrumentation, - Tata Mc-Graw Hill Publishing Company, New Delhi.
2. Cooper, Helfrick – Electronic Instrumentation and Measurement Techniques, A Prentice Hall of India. New Delhi.

Reference Books: -

1. B.R. Gupta-Electronics and Instrumentation – Wheeler Publishing.
2. Rangan, Sharma & Mani – "Instrumentation – devices & Systems."

Tata Mc-Graw Hill Publishing Company, New Delhi.

3. R.P. Jain-Digital Electronics, Tata Mc-Graw Hill Publishing Company, New Delhi.
4. Microprocessors and Digital Systems, by:D.V. Hall,Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Shoen Beck- Electronic Communication, Prentice Hall of India. Pvt. Ltd. New Delhi.
6. B. Ram- fundamental of Microprocessors, Dhanpat Rai & Sons, New Delhi.
7. A.K. Sawhney – Acourse in Electrical & Electronics Instrumentation, Dhanpat Rai & Sons, New Delhi.

7SEE05 ELECTIVE I
II POWER SYSTEM SIMULATION
SECTION-A

Unit I   :   Representation of power systems for computerized analysis : Mathematical models of Synchronous generator for steady state and transient analysis . Transformer with tap changer, transmission line,phase shifter and loads.

Unit II   :   Topology of Electric Power Systems – Network Graphs , Incidence matrices, fundamental loop and cutest matrices, primitive impedance and admittance matrices, equilibrium equations of networks . Singular and Nonsingular transformation of network matrices .

Unit III   :   Formation of bus impedances and admittances matrices by algorithm – Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix.
Three phase network elements – transformation matrix – incidance and network matrices for three phase l networks . Algorithm for formulation of 3 phase bus impedance matrix.

SECTION-B

Unit IV   Short circuit studies : Three phase networks , Symmetrical components. Thevenin's theorem and short circuit analysis using bus impedance matrix . Short circuit calculations for balanced three phase networks using bus impedance matrix.

Unit V   Load flow studies : formation of load flow problem – Gauss Seidel method – Newton Unit III Raphson method – decoupled method, fast decoupled methods – sparsity technique.

Unit VI   :   Stability studies of power system – Development of mathematical model for multimachine system stability analysis

–Formation of equations and methods of solutions .Transient stability analysis including synchronous machines , system networks and loads .

Solution of state equation by modified Euler method and Runge Kutta 4th order Approximation method.

TEXT BOOKS:
1) L.P.Singh : Advanced Power System Analysis and Dynamics, WEL.
2) Y.Wallach : Calculations and programs for Power System Network.
3) G.W.Stage and A.H.El-Abiad : Computer Methods in Power System Analysis, McGraw Hill.

REFRENCE BOOKS:
1) R.N.Dhar : Computer Aided Power System Operation and Analysis, TMC.
2) M.A. Pai : Computer Techniques in Power System Analysis, TMH

7SEE05 ELECTIVE I
III HIGH VOLTAGE ENGINEERING
SECTION-A

Unit I   Breakdown in Gases
Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsend's law, Streamer mechanism of spark pashan's law, Corona discharge, Electronegative gases.

Unit II   Breakdown in Liquid and Solid Dielectrics
Breakdown in pure and commercial liquids, Sold dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III   Lightning and Switching Over Voltage and Protection
Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV   High Voltage and Current Generation, Generation of high d.c, a.c and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V   High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Non-destructive measurement and testing, High voltage dielectrics loss and capacitance measurement, Radio

frequency and Partial discharge measurement.

Unit VI   High Voltage Testing and E.H.V.Lines Design.
Basic terminology, Testing – Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

Text Book-
1. M.S.Naidu and V.Kamraju – High Voltage Engineering, Tata McGraw Hill Publishing, Company, New Delhi.

Reference Books-
1. E.Kuffer and W.S.Zaenglo- High Voltage Engineering, Pergamon Press,
2. Rokosh Das Begamudre- EHV AC. Transmission Engineering, Wiley Easter Ltd. New Delhi.
3. E.Kuffer and M.Abdullaha _High Voltage Engineering, Pergamon Press
4. M.S.Naidu and V.N.Maller- SF6 and Vaccum Insulation for High Voltage Application, Khanna Publications, Delhi.
5. Prof.D.V.Razeving (Translated from Russian by Dr.M.P.Chaurasia) – High Voltage Engineering, Khanna Publications, Delhi.
6. An introduction to High Voltage Engineering by Subir Ray, Prentice –Hall & India, Private Limited, New Delhi.
7. High Voltage Engineering by C.L. wadhawa New Age international (P) Ltd. Publications

7SEE05 ELECTIVE I
IV WIND ELECTRICAL SYSTEMS
SECTIONA

Unit I   Fundamentals of Wind Turbines
Power Contained in Wind, Thermodynamics of Wind Energy, Efficiency Limit for Wind Energy Conversion, Maximum Energy Obtainable for a Thrust-operated Converter,Efficiency Limit for a Thrust – operated Converter Types of Wind Energy Conversion Devices, Dutch Windmills, Multiblade Water – pumping Windmills , High – speed Propeller – type Wind Machines The Savonius Rotor, The Darrieus Rotor, Aerodynamics of Wind Roto Aerodynamic Efficiency, Power – Speed Characteristics, Torque – Speed Characteristics, Wind Turbine Control Systems, Control Strategy

Unit II   Wind Site Analysis and Selection

Wind Speed Measurements Robinson Cup Anemometer, Pressure Tube Anemometer, Hot Wire Anemometer, Wind Speed Statistics Statistical Wind Speed Distributions, Site and Turbine Selection

Unit III   Basics of Induction and Synchronous Machines

The Induction Machine, Constructional Features, Steady-state Equivalent Circuit Model, Performance Characteristics, Saturation Characteristics, Modified Equivalent Circuits, Effect of Rotor-injected Emf – Slip Power Recovery Scheme, Dynamic d-q Axis Model

The Wound-field Synchronous Machine, Constructional Features, Dynamic Machine Equations, Steady-state Operation, Steady-state Model with Rectifier Load, The Permanent Magnet Synchronous Machine Constructional Aspects, Steady-state Equations, Power Flow Between Two Synchronous Sources, Induction Generator Versus Synchronous Generator

SECTION B

Unit IV   Grid-connected and Self-excited Induction Generator Operation

Constant-voltage, Constant-frequency Generation, Single-output System

Double-output System with a Current Converter , Equivalent Circuits, Reactive Power and Harmonics, Double-output Systems with a Voltage Source Inverter, Reactive Power Compensation, Variable-voltage, Variable-frequency Generation, The Self-excitation Process, Circuit Model for the Self-excited Induction Generator, Analysis of the Steady-state Operation, The Steady-state Characteristics, The Excitation Requirement, Effect of a Wind Generator on the Network

Unit V   Generation Schemes with Variable-speed Turbines

Classification of Schemes, Operating Area Induction Generators , Cage Rotor Induction Generator, Doubly Fed Induction Generator, Wound-field Synchronous Generator, The Permanent Magnet Generator

Unit VI   Hybrid Energy System

Diesel Generator and Photovoltaic System, Diesel Engine, Photovoltaic Power Generation

Wind-Diesel Hybrid System. System With No Storage, System With Battery Backup

Wind-Photovoltaic Systems, Wind Solar hybrid system

Text book :-

S.N.Bhadra, S.Banerjee, D.Kastha Wind Electrical System, Oxford University Press, India.

SEMESTER : EIGHTH
8SEE01 POWER SYSTEM OPERATION & CONTROL
SECCTION-A

Unit I   :   **Economic Operation – Part I**

Meaning of optimum scheduling, UCP and LSP; Input – Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

Unit II :   **Economic Operation – Part II**

Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Unit III :   **A. Generator Control Loops**

Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

B. Automatic Voltage Regulator (AVR)

Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION-B

Unit IV :   **Automatic Load Frequency Control**

Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V :   **Control Area**

Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system – Dynamic response; Tie-line bias control.

Unit VI : **Steady-State Instabilities**

Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

TEXT BOOKS :-

1. O. L. Elgerd – Electric Energy Systems Theory: An Introduction – Second edition, McGraw-Hill Book Comp. N. Y. 1987.

2. Power System Operation & Control, N.V.Ramana, PEARSON education, 2010.

Reference Books :

1. L. K. Kirchamayor – Economic Operation of Power System- Wiley Estern Pvt. Ltd., New Delhi.

2. Hadi Saadat – Power System Analysis – WCB/McGraw-Hill International Edition 1999

3. I. J. Nagrath, D. P. Kothari – Modern Power System Analysis – Second edition, Tata Mc-Graw Hill Publishing Company, New Delhi

4. P. S. R. Murty – Power System Operation and Control – Tata Mc-Graw Hill Publishing Company, New Delhi.

5. Wood and Wollenberg – Power Generation, Operation and Control – Willey – Inter Science Publication

8SEE02 SWITCHGEAR & PROTECTION
SECTION-A

Unit I : Circuit Interruption

Circuit breaker control circuit, Fault clearing process, Auto-reclosure, Arc phenomenon- maintenance, properties and interruption theories; AC circuit breakers- current interruption, transient recovery voltage (TRV), rate of rise of TRV, factors affecting TRV, ratings; Inductive and Capacitive current interruptions, current chopping.

Unit II : A. Fuses Types, Constructional features, operation, Characteristics and Applications

B. Circuit Breaker (Part – I)

Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operationand application.

Unit III : Circuit Breaker (Part – II)

SF_6, Vaccum, Miniature, Earth leakage and Moulded Case – types, Constructional features, operation and application; Testing, Instalation and Maintenance.

SECTION-B

Unit IV : A. Relaying Principle

Components, Essential features, Characteristics, Terminology, CT's and PT's, Relay classification.

B. Electromagnetic Relays

Overcurrent, Directional, Distance and Differential – types, constructional features, operation, characteristics and application.

Unit V : Protection of Transmission Lines

Relaying schemes – overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.

Unit VI : A. Other Power System Elements Protection Transformers, Motors, Generators and Buses.

B. Static Relaying

Basic concepts, equipments, comparators, Characteristics realization – overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

Text Book:-

1. Sunil S. Rao – "Switchgear and Protection" Khanna Publications New Delhi

Reference Books: -

1. R. T. Lythall – "Switchgear Handbook" J and P Newness Butterworth, London.

2. C. R. Mason – "The Art and Science of Protective Relaying"

3. A. R. Van and C Warringtan – "Protective Relaying , Vol 1 and 2," Chapman Hall, London.

4. Geosonoviz – "High Voltage Circuit Breakers"

5. V. A. Slabikov – "Generation Protection and Switchgear" CIT, Coimbatore.

6. Badri Ram and B. N. Vishwkarma – "Power System Protection and Switchgear" Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

7. B. Ravindranath and M Chander – "Power System Protection and Switchgear" Wiley Eastern Ltd, New Delhi.

Practicals:

Minimum TEN experiments based on above syllabus, preferably with uniform distribution.

8SEE03 EMBEDED SYSTEMS

Unit-I   Introduction: Embedded systems design, Embedded system architecture, Embedded systems model, An Overview of Programming Languages and Examples of Their Standards, Standards and Networking, Multiple Standards-Based Device Example: Digital Television (DTV).

Unit-II   Embedded Hardware Building Blocks and the Embedded Board, powering the hardware, Instruction Set Aarciteture (ISA) architecture model, internal processor design and its performance.

Unit-III: Memory: ROM, RAM and auxiliary memory, Memory Management of Extemal Memory , Performance of memory .I/O : Managing Data: Serial vs. Parallel I/O , Interfacing the I/O Components ,I/O performance.Buses: arbitration, timing and performance.

Unit-IV: Device Drivers: Device Drivers for Interrupt-Handling, Memory Device Drivers, On-board Bus Device Drivers, Board I/O Driver. Embedded OS: Multitasking and Process Management, Memory Management ,.

Unit-V: Embedded OS : I/O and File System Management ,OS Standards: POSIX, OS Performance Guidelines. Middleware :meaning and examples. Application layer software: meanings and examples.

Unit-VI: Embedded system design & implementation: Defining the System-Creating the Architecture and Documenting the Design, Stages in creating an Embedded System Architecture. Implementing the Design. Quality Assurance and Testing of the Design.

Text Book:
       Tammy Noergaard "Embedded Systems Architecture" Elsevier Newnes Publication.

References:
1.   Rajkamal , "Embedded Systems, Architecture, Programming & Design" TMH.
2.   Jane W. S. Liu 'Real Time Systems", Pearson Education
3.   Vahid & Givargis "Embedded System Design" John Wiley & Sons P Ltd.
4.   Peter Marwedel "Embedded Systems Design" Springer, Netherland.

8SEE04 ELECTIVE II
I POWER SYSTEM MANAGEMENT
SECTION-A

UNIT-I: Principle and Practice of Management:

Basic Concepts- basic concepts of management-Role and importance of management in modern society, management as a profession

The Process of Management- The process of management; planning, organizing, directing, controlling, decision-making, leading etc.

Management Concepts- Managerial authority and responsibility-delegation and decentralization- Line and staff concepts-concepts in e-commerce etc.

UNIT-II   :   **Marketing & Production/Operation Management:**

Marketing Management- Introduction to Marketing, Marketing strategy, Consumer Behaviour, Marketing Research, Product/Services Decisions, Pricing Products/Services, Distribution management, Advertising & Sales promotion etc.

Production/Operation Management- Introduction to Production Planning and Process, Issues in Material and Inventory Management, Quality control and Management (quality circle, ISO 9000 series, just-in-time, TQM.), Maintenance Management, Purchasing Decision.

UNIT-III   :   **Project, Financial & Human Resource Management:**

Project Report: Preparation of -Project Report, Profit and Loss statement, Balance Sheet.

Financial Management: Costing- Principles, types-operating, marginal, incremental, embedded etc, Budgeting & financial planning, Risk management etc.

Human Resource Management: Human resource planning-concepts & process, Job   analysis &   description-recruitment, selection process, Training & development, Employee welfare, issues related to management of trade union.

SECTION-B

UNIT-IV   :   Dimensions of Power System Restructuring

Power system Restructuring:: Introduction to Power Sector Reforms/Restructuring/Deregulation – issues, prospects and lessons to developing countries

Environmental dimensions in power sector: Pollution & Depletion of natural resources, Waste Management, environmental legislation, green power, strategies for environmental management in power sector.

Rural Electrification: Issues relating to revised definition of village electrification, issues in electrifying remaining villages, decentralized generation and distribution for rural electrification etc.

Power Sector Restructuring in India: History, Problems and status in India, Accelerated Power Development and Reform Programme (APDRP), Reforms in G,T, D sector, Electricity Act:2003- issues, Problems & prospects, Legal and regulatory framework, Rural Electrification Programme, Environmental Pollution Programme.

UNIT-V : Management issues in Power Sector:

Financing of power sector:: Financial problems of SEBs, strategies - for financing capacity addition to generation, transmission and rural electrification, Risk management in power sector.

Human Resource development in power utilities: Change management, Training & Development, Culture of empowerment and accountability etc.

Transmission & Distribution Management: Transmission management under open access- transmission Pricing/Tariff, Congestion Management, Micro distribution models- private investors, Multi Licensee System, Distribution Management, Power Quality, Demand Side Management, Energy Metering, Accounting and Auditing, SCADA etc.

UNIT-VI : Marketing issues in Power Sector:

Issues of Power Tariff, Prices in Competitive Electricity Markets, Bidding strategy, Availability Based Tariff (ABT), Embedded and Spot pricing, Power Trading, Market Operations in Electric Power Systems, Marketing of energy and services in competitive electricity markets.

TEXT BOOKS:

1. Koontz H., O'Donnel C. and Whierich: Principle of Management, Tata McGraw Hill Publishing Co., Ltd., New Delhi
2. Muhlemann , Production Operation Management, Macmillan publication
3. Dencenzo & Robbins, Human Resource Management
4. Monappaa, Human Resource Management, Macmillan Publication
5. Ramaswamy & Namamkumari, Marketing Management Macmillan

Publication
6. Philip Kotler, Marketing Management, PHI, New Delhi

REFERENCE BOOKS:

1. Economic Evaluation of Projects in the Electricity Supply Industry, by H. Khatib.
2. Fundamentals of Power System Economics, by Daniel S. Kirschen, Goran Strabac
3. Energy and Power Risk Management by Alexander Eydeland, KrzysztofmWolyniec
4. Power System Economics, by Steven Stoft
5. Market Operations in Electric Power Systems, by M. Shahidehpour, H. Yamin, Zuyi Li.
6. Electricity Economics, by Geoffrey Rothwell, Tomas Gomez
7. Modelling Prices in Competitive Electricity Markets (The Wiley Finance Series), by Derek W. Bunn.
8. A Shock to the System, by Timothy J. Brennan, Karen L. Palmer, Raymond J. Kopp, Alan J. Krupnick, Vito Stagliano, Dallas Burtraw.
9. Power pricing by Dolan & Siman, The free Press,1996
10. Customer Choice: Purchasing Energy In A Deregulated Market: by Albert Thumann
11. India's Power Sector Reforms Update, Paryas, Pune

8SEE04 ELECTIVE II
II FUZZY LOGIC & CONTROL
SECTION A

UNIT - I **THE MATHEMATICS OF FUZZY CONTROL:** Basic definitions, a-level sets, comparison with classical (crisp) sets Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, Fuzzy complement, t-norms, t-conorms, combination of operations, aggregation operations., fuzzy relations, the extension principle

UNIT – II THEORY OF APPROXIMATE REASONING:

Fuzzy numbers, linguistic variables, arithmetic operations on intervals, arithmetic operations on fuzzy numbers, lattice of fuzzy numbers, fuzzy equations.

Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference.

Unit - III **Fuzzy Relations:** Crisp versus fuzzy relation, projections and cylindric extensions, binary fuzzy relations, binary relations on a single set, fuzzy equivalence relations, fuzzy compatibility and fuzzy ordering relations.

Possibility Theory: Fuzzy measures, evidence theory, possibility theory, fuzzy sets and possibility theory.

SECTION B

Unit - IV   **Fuzzy Logic:** An overview of classical logic, multivalued logic, fuzzy propositions, fuzzy quantifiers, linguistic hedges, inference from conditional fuzzy propositions, inference from conditional and qualified propositions.

NON-LINEAR FUZZY CONTROL: FKBC as a linear transient element, PID like FKBC, sliding mode FKBC, Sugeno FKBC.

Unit - V   **FUZZY KNOWLEDGE BASED CONTROLLERS (FKBC):** Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures. Simple applications of FKBC (washing machines, traffic regulations, lift control, etc).

UNIT - VI   **ADAPTIVE FUZZY CONTROL:** Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

TEXT BOOKS:

1. An Introduction to Fuzzy Control- D. Diankar, H. Hellendoom and M. Reinfrank- Narosa Publishers India, 1996.
2. Fuzzy Sets Uncertainty and Information- G. J. Klir and T. A. Folger- PHI IEEE, 1995.

REFERENCE BOOKS:

1. Essentials of Fuzzy Modeling and Control- R. R. Yaser and D. P. Filer -John Wiley, 1994.
2. Fuzzy Logic With Engineering Applications- Timoty Ross,- McGraw Hill.
3. Fuzzy Logic Intelligence Control And Information- Yen- Pearson education.

8SEE04 ELECTIVE II
III RPC & FACTS CONTROLLER

UNIT-I   CONTROL OF VOLTAGE AND REACTIVE POWER
Introduction, Generation and absorption of reaction power, relation between voltage, power and reactive power at a node,

methods of voltage control. Injection of reactive power, use of tap changing transformers, combined use of tap changing transformers and reactive power injection.

Unit II   Introduction to FACTS- Basic Types of FACTS controllers, Description and definition of FACTS controllers – Benefits from FACTS technology- Static Var Compensator(SVC): Principle of operation, configuration and control, Thyristor Controlled Series compensator(TCSC): Principle of operation, configuration and control, Application of TCSC for damping electromechanical Oscillations, Application of TCSC for mitigation of SSR –

Unit III   Static Compensator(STATCOM): Principle of operation, configuration and control – Static Synchronous Series Compensator(SSSC): Principle of operation, configuration and control, Thyristor Controlled Phase Angle Regulator(TCPAR): Principle of operation, configuration and control, Unified Power Flow Controller(UPFC): Principle of operation, configuration and control, Simulation of UPFC, Steady state model of UPFC, Interline Power Flow Controller(IPFC) - Principle of operation, configuration and control.

Unit IV   Oscillation Stability Analysis and Control: Introduction – Linearised model of power systems installed with FACTS based Stabilisers – Heffron-Phillips model of a SMIB system installed with SVC, TCSC and TCPS – Heffron-Phillips model of a SMIB system with UPFC – Heffron-Phillips model of a Multimachine system installed with SVC, TCSC and TCPS

Unit V   Analysis and Design of FACTS based stabilisers: Analysis of damping torque contribution by FACTS based stabilisers installed in SMIB systems, Design of robust FACTS based stabilisers installed in SMIB systems by phase compensation method - Selection of installing locations and feed back signal for FACTS based stabilizers

Unit VI   Transient Stability control with FACTS: Introduction – Analysis of Power systems installed with FACTS devices: Power transmission control using Controllable Series Compensation(CSC), Power Transmission Control using SSSC, Power Transmission Control using UPFC, Power Transmission Control using Phase Shifting Transformer(PST), Power Transmission Control using UPFC, Control of FACTS devices for transient stability improvement – General considerations of FACTS control strategy: CSC,SSSC, SVC, STATCOM and UPFC control strategy – General Structure of the FACTS devices control.

Reference books :-

1. 'Reactive Power Control in Power Systems' T J E Miller,John Wiley, 1982
2. 'Computer modeling of Electrical Power Systems'J Arriliga and N R Watson, – John Wiley, 2001
3. 'Understanding FACTS' N G Hingorani and L Gyugyi, IEEE Press, 2000
4. 'Flexible ac Transmission Systems(FACTS)', Y.H. Song and A.T. Johns, IEE Press, 1999

8SEE04 ELECTIVE II
IV POWER QUALITY
SECTION A

Unit I   **Introduction**

Power Quality Definition, Need for Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers,

Unit II   **Power Quality Characteristics**

Power Quality Theory, Types of power Quality Problems, Voltage Swells, Long-Duration Over voltages, Under voltages, Interruptions, Transients, Voltage Unbalance, Voltage Fluctuations, Harmonics, Electrical Noise, Sources of Power Quality Problems, Utility Side of the meter, End-User Side of the meter, Effects of Power Quality Problems, Power Quality Problem-Solving Procedures, Power Quality Solutions,

Unit III   **Power Quality Standards**

Power Quality Standards Organizations, Institute of Electrical & Electronics Engineers (IEEE), American National Standards Institute(ANSI), International Electrotechnical Commission(IEC Other International Standards Organizations, Purpose of Power Quality Standards, Types of Power Quality Standards, Voltage Sag (Dip) Standards, Transients of Surges, Voltage Unbalance, Voltage Fluctuation or Flicker Standards, Harmonics Standards, Transformer Overheating Standards, Natural Conductor Loading Standards, Static Electricity, Telephone Power Quality Standards, Grounding and Wiring Standards,

Sensitive Electronics Equipments Standards, Trends in Power Quality Standards.

SECTION-B

Unit IV   Power Quality Solutions

Reduce Effects on Sensitive Equipment, Reduce or Eliminate Cause, Reduce or Eliminate Transfer Medium, Install Power Conditioning Equipments, , Surge Suppressors, Noise Filters, Isolation Transformers, Line-Voltage Regulators, Motor-Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions

Unit V   Wiring and Grounding

Wiring Principles, Grounding Principles, Power System, Utility Power System Grounding,Telecommunication System Grounding, End-User Power System Grounding, Wiring and Grounding Problems, Ground Loops, Electromagnetic Interference (EMI) Noise, Loose Connections, Grounding for Lightning and Static Electricity, Attack of the Triplens, Solutions That Cause Problems, Wiring Solutions, Separation, Selection of Wire and Cables, Shielding, Grounding Solutions, Ground Rods, Ground Ring, Ground and Reference Signal Grids, Other Grounding Systems, Isolated Grounds, Multipoint Grounding, Separately Derived Source Grounding, Reference

Unit VI   Power Quality Measurement Tools & Power Quality Surveys

Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

Text Book: -

1. Barry W. Kennedy: Power Quality Primer, McGraw-Hill

Reference Book: -

1. G.T. Heydt: Power Quality Stars in a circle Publication, Indiana, 1991.

REGULATION NO. 3 of 2011

Examinations leading to the Degree of Bachelor of Engineering (Electrical and Electronics Engineering) (Four Year Degree Course ...... Semester Pattern) Regulation, 2011

Whereas it is expedient to frame the Regulation in respect of Examinations leading to the Degree of Bachelor of Engineering (Electrical and Electronics Engineering) (Four Year Degree Course ...... Semester Pattern) for the purposes hereinafter appearing the Management Council is hereby pleased to make the following Regulation.

1. This Regulation may be called "Examinations leading to the Degree of Bachelor of Engineering (Electrical and Electronics Engineering) (Four Year Degree Course ...... Semester Pattern) Regulation, 2011."

2. This Regulation shall come into force w.e.f. the Academic session :-

    i)   2009-2010 for Ist & IInd Semester B.E.,

    ii) 2010-2011 for IIIrd & IVth Semester B.E.,

    iii) 2011-2012 for Vth & VIth Semester B.E., and

    iv) 2012-2013 for VIIth & VIIIth Semester B.E.

3. The schemes of teaching & examinations for First, Second, Third and Fourth year in respect of Examinations leading to the Degree of Bachelor of Engineering (Electrical and Electronics Engineering) (Four Year Degree Course ...... Semester Pattern) shall be as per Appendices - A, B, C and D appended with this Regulation respectively.

*****