

EE2K 303 : MECHANICAL ENGINEERING I

Module I (13 hours)

Thermodynamic systems - Thermodynamic properties and processes - Heat and work ..
Equations of-state - Properties of ideal gases - Properties of pure substances - PVT, PT, TS, PV diagrams - Zeroth law of thermodynamics - First law of thermodynamics - Applications of first law to various thermodynamic processes in open and closed systems - Internal energy and enthalpy - Steady flow energy equations - Introduction to second law - Entropy - Available energy and unavailable energy

Module II (13 hours)

Engineering application of thermodynamics - Air cycles - Principle of operations of IC engines - Two stroke - Four stroke - SI and CI engines - Air cycle refrigeration - Gas turbine cycles - Open and closed cycle - Regeneration and intercooling - Vapour power cycles
Mollier diagrams - Rankine cycle - Vapour compression refrigeration cycle

Module III (13 hours)

Conventional and non-conventional energy sources - Thermal power plants - Steam power plant layout - Study of various systems - Steam generators - High pressure boilers - Steam power plant accessories - IC engine and gas turbine power plants - Study of various systems and accessories - Hydel plants - Layout and classification - Components and their functions

Module IV (13 hours)

Steam turbine - Impulse and reaction turbine - Compounding - Velocity diagrams - Reheat factor - Various efficiencies - Turbine characteristics governing - Operation and maintenance - Gas turbine - Aviation and industrial applications - Single stage and multistage turbines Air compressors - Reciprocating and rotary compressors

EE2K 304: ELECTRONICS I

Module I. Semiconductors and devices (14 hours)

Field intensity - Potential energy - Mobility - Conductivity - Electrons and holes - Charge density in semiconductors - Electrical properties of silicon and germanium - Diffusion Potential variation within graded semiconductors - Open circuit p-n junction - p-n junction

As a rectifier - V-I characteristics - Temperature dependence - Diode resistance - Transition capacitance - Minority carrier storage - Diffusion capacitance - Breakdown diode - Schottky diode - Junction transistor - Current components - Construction - CE and CB characteristics - Ratings - Construction and characteristics of JFETS and MOSFETS

Module II: Diode circuits (12 hours)

Diode as a circuit element - Load line - Piecewise linear model - Single phase half wave and full wave rectifier Circuits - Voltage regulation - Ripple factor - Rectifier efficiency - Transformer utilization factor - Bridge rectifier - Rectifier filters - LC and LC filters and comparison Diode currents and supply line currents for various filters - Diode clipping circuits - Single level and two level clippers - Clamping circuits - Clamping circuit theorem

Module III: Amplifier circuits (13 hours)

Operating point of a BJT - Bias stability - Thermal runaway - Fixed bias and self bias design - Concept of small signal operation - Amplification in CE amplifier - Transconductance and its relation to CE voltage gain - h parameter model of a BJT - CE, CB and Emitter follower analysis and comparison using hybrid equivalent circuit - Considerations in cascading transistor amplifiers

- Biasing a JFET and MOSFET -Small signal model- CS and CD amplifiers- Class Band ClassAB- Power amplifiers using BJT

Module IV: Frequency response of amplifiers (s-domain approach is envisaged) (13 hours) Low frequency response of BJT and FET amplifiers - Dominant time constant - selection of coupling and bypass capacitors - Hybrid equivalent circuit of BJT .. High frequency response of CE current gain - ω_c cut off and ω_{β} cut off frequencies - Gain bandwidth product

Miller effect.. Emitter follower at high frequencies - FET at high frequencies.- Differential amplifiers - Common mode and differential mode gains" CMMR - Constant source biasing Offset behavior

EE2K 305 : ELECTRIC CIRCUIT THEORY

Module I: S-domain analysis of circuits (13 hours)

Laplace transform - Transform pairs - Gate functions -Shifting theorem - Solution of differential equations by Laplace transforms -Initial and final value theorems - Laplace transforms of periodic signals - Inversion of transforms by partial fractions - Convolution theorem and convolution integral- Transformation of a circuit into s-domain - Transformed equivalent of inductance - Capacitance and mutual inductance - Impedance and admittance in the s-domain - Node analysis and mesh analysis of the transformed circuit - Nodal admittance matrix and mesh impedance matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits - Input and transfer impedance functions.- Transfer functions - Impulse response and transfer function.. Poles and Zeros - Pole Zero plots.- Sinusoidal steady state from Laplace transform inversion - Frequency response by transfer function evaluation on j ω axis- Frequency response from pole-zero plot by geometrical interpretation

Module II (13 hours)

Fourier series

Fourier series representation of non-sinusoidal periodic waveforms - Fourier coefficients - Determination of coefficients - Waveform symmetry - Exponential Fourier Series - Discrete amplitude and phase spectra - Steady state solution of circuits with non-sinusoidal periodic inputs by Fourier Series - Harmonics in three phase sources - Harmonic currents in star and delta connected non-linear loads - Triplen harmonics in three phase voltages and currents

Fourier transforms

Fourier representation of a periodic signals -Fourier transform and inverse transform - Transform pairs -Properties of Fourier transforms - Continuous amplitude and phase spectra Frequency response function - Impulse response and its Fourier transform - Relation between Laplace transforms and Fourier transforms - Power spectral density - Energy spectral density - Parseval's theorem - Signal transmission systems - Signal distortion - Bandwidth requirement for signal transmission

Module III(14 hours)

Two port networks

Two port networks - Characterization in terms of impedances and admittances - Hybrid and transmission parameters - Inter relationships among parameter sets - Reciprocity theorem - Interconnection of two port networks - Series, parallel and cascade - Network functions Pole zero plots and steady state response from pole - zero plots

Symmetrical two port networks

T and n Equivalent of a two port network - Image impedance - Characteristic impedance and propagation constant of a symmetrical two port network - Properties of a symmetrical two port network

Symmetrical two port reactive networks as filters

Filter fundamentals - Pass and stop bands-behavior of iterative impedance-Constant-k low pass filter-Constant-k high pass filter- m-derived T and n sections and their applications for infinite attenuation and filter terminations-band pass and band elimination filters

Module IV (12 hours)

Introduction to network topology

Definition of graph, trees, incidence matrix - Properties of incidence matrix - Cut sets - Fundamental cut sets - Cut set schedule - Tie sets - Fundamental tie sets - Tie set schedule relationships among incidence matrix, cut set matrix and tie set matrix - Kirchhoff's laws in terms of network topological matrices - Formulation and solution of network equations using topological methods - Loop analysis. Cut set analysis

EE2K 306 : ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS 3 hours

Module I (13 hours)

Indicating instruments. Principle - Different types of control and damping arrangements in indicating instruments . Permanent magnet moving coil, moving iron, hot wire, electrostatic and dynamometer type meters - Ammeters and Voltmeters - Errors in indicating instruments - Rectifier type meters. Factors influencing its performance - Digital meters - Introduction - Digital voltmeter – Block diagram - Digital multimeter - Principles of ac voltage measurements - True RMS digital meter I - Extension of instrument range - Shunts for ammeters - Voltmeter multipliers – Instrument transformers - Current transformer - Phasor diagram - Ratio and phase angle error. Use of instrument transformers with wattmeter ~ Clip on meters - Hall effect clip on meters - Errors

Module II (13 hours)

Wattmeters, energymeters and other measuring instruments

Measurement of energy and power - Dynamometer type wattmeter - Error and Compensation - Principle of working of ampere hour meter - Single and Three phase energy meters - Errors and Compensation - Calibration using wattmeter and rotating standard - Static wattmeters and Energy meters - Principles and block diagram - Trivector meter - Frequency meters.

Power factor meters

Module III (13 hours)

Measurement of resistance

Wheatstone bridge - Kelvin double bridge - Carey Foster Slide wire bridge - Sensitivity of dc bridges - Interchange of battery and galvanometer - Bridge current limitations - ohmmeter Megger - Measurement of insulation resistance by direct deflection method.. Earth electrodes - Earth resistance - Earth tester - Localization of cable fault by Murray and Varley loop

AC bridges

Measurement of inductance using Maxwell and Anderson bridges - Measurement of capacitance using Schering bridge

Module IV (13 hours)

Potentiometers

General principle - Modern form of dc potentiometers - Vernier dial principle - Standardization ac potentiometers - Coordinate and polar types - Application of dc and ac potentiometers

Magnetic measurements

Classification of magnetic measurements - Measurement of flux and permeability - Hebert's magnetic standard - Fluxmeter - Hall Effect Gaussmeter - Ballistic galvanometer - BH curve and permeability - Measurement of bar and ring specimen - Hysteresis measurement - Core loss and measurement with Lloyd. Fisher square

EE2K 307(P) : ELECTRONICS LABORATORY I

Use of CRO: a) Measurement of current voltage, frequency and phase shift. b) z. modulation of frequency measurement Semiconductor diodes: V-I and transfer characteristics of Si, Ge and zener diodes Transistor characteristics in CB and CE configurations ~ Identification of cut off, active and saturation regions

4. JFET; characteristics in the common source configuration - Det.

circuit parameters 5 RC coupled amplifier using BJT CE configuration- Measurement of output impedance and frequency response
 FET amplifier- Measurement of voltage gain, current gain, input and output impedance
 UIT relaxation oscillator- Design for a particular frequency
 Rectifiers and filters with and without shunt capacitors- Characteristics of bridge rectifiers- Ripple factor, Rectification factor, Full wave and bridge rectifiers
 9. BJT emitter follower- Measurement of voltage gain, current gain, input and output impedance and load characteristics
 10. Characteristics of clipping and clamping circuits using diodes
 11. Characteristics of voltage regulators- Design and testing of: a) Zener regulator b) Zener regulator with emitter follower output
 12. Power amplifiers- Class AB (complementary symmetry)
 13. Design and set up a differential amplifier using LM 3040 and LM 308G
 Measurement of common mode gain, differential gain, CMRR and frequency response

EE2K 401: ENGINEERING MATHEMATICS IV

Module I: Functions of a complex variable & applications I (13 hours) - - -
 Functions of a complex variable, Analytic functions - Cauchy-Riemann conditions - Functions of z - Conformal mapping- Bilinear transformation - Möbius transformation - Transformation by other functions

Module II: Functions of a complex variable & applications II (13 hours)
 Integration in the complex plane - Cauchy's integral theorem - Cauchy's integral formula - Taylor's series - Laurent's series - Residue theorem - Real definite integrals - Complex definite integral

Module III: Ordinary differential equations & special functions (13 hours)
 Power series method of solving ordinary differential equations - The method of Frobenius - Series solution of Bessel's equation - Modified Bessel functions - Legendre polynomials - Applications - Legendre polynomials

Module IV: Partial differential equations (13 hours)
 Derivation of equations - D'Alembert's solution of the wave equation - Characteristic and the classification of partial differential equations - Separation of variables... Orthogonal functions and the general expansion problem - Further applications - Laplace transform methods

EE2K 402: LINEAR SYSTEMS ANALYSIS

Module I: System concepts and modelling of systems (11 hours).
 Systems - Subsystems - Elements - Systems approach - Classification of systems - Static and dynamic systems - Linear and Nonlinear Systems - Distributed and lumped systems
 Time invariant and time varying systems - Stochastic and deterministic systems - System modeling and approximations - Superposition principle - Homogeneity and additivity Modelling of electrical systems - Active and Passive elements - Resistance inductance and capacitance - dynamic equations using Kirchhoff's current and voltage laws. RL, RC and RLC circuits and their dynamic equations - Block diagrams and signal flow graphs- Mason's gain formula

Module II: Modelling of non-electrical systems (11 hours)
 Modelling of translational and rotational mechanical systems - Differential equations for mass spring dashpot elements, D'Alembert's principle - Rotational Inertia - Stiffness and bearing friction - Gear trains - Equivalent inertia and Friction referred to primary and secondary shafts - Dynamic equations for typical mechanical systems - Electromechanical Analogues Force-current and force-voltage analogue - Capacitance and Resistance of thermal, hydraulic pneumatic systems - Dynamic equations for simple systems - Comparison of electrical, electromechanical, hydraulic and pneumatic systems

Module III: Transferfunction and time domain analysis (15 hours)

Use of Laplace transforms - Concept of transfer function - Impulse response - Convolution integral - Response to arbitrary inputs - Transfer function of typical systems discussed, in Module I - Time domain analysis - Test Inputs - Step - velocity and ramp inputs - Transient and steady state response - First and second order - under damped and over damped responses - Maximum Overshoot - settling time - Rise time and time constant - Higher order systems Steady state error - Error constants and error different types of inputs - Fourier series expansion of periodic functions - Symmetry conditions - Exponential form of Fourier series Fourier integrals and Fourier transform - Spectral properties of signals - Analysis by Fourier methods

Module IV: State space analysis and stability of systems (15 hours)

Concept of state - State space and state variables - Advantage over transfer function approach - State equations for typical electrical and mechanical and electromechanical systems - Representation for linear time varying and time invariant systems - Solution of state equation for typical test inputs - Zero state and zero input response - Concept of stability - Bounded input bounded output stability - Lyapunov's definition of stability - Asymptotic stability Stability in the sense of Lyapunov - Routh Hurwitz criterion of stability for Single Input Single Output linear systems described by transfer function model

EE2K 403 : MECHANICAL ENGINEERING II

Module I (13 hours)

Fluids and continuum - Fluid properties - Ideal and real fluids - Fluid statistics - Fluid pressure - Manometers - Hydrostatic force, on plane and curved surfaces immersed in fluids Center of pressure - Buoyancy - Metacentric height - Fluid dynamic - Equation of continuity - Momentum energy - Laminar and turbulent flow - Friction factor

Module II (13 hours)

Hydraulic machines - Turbines- Impulse and reaction turbines - Velocity diagrams - Characteristics - Governing, surging and cavitation - Pumps - Reciprocating and centrifugal-- Pump performance-Dimensional analysis and similitude - Buckingham's PI theorem - Raleigh's method - Application of DA to problems in fluid flow - Turbo machines - Heat transfer Various dimension-less numbers and their significance in fluid mechanics

Module III (13 hours) ,

Heat transfer - Basic modes - Conduction - Convection' - Radiation Fourier law - General conduction equation - One dimensional conduction in simple geometries - Conduction with heat generation - Critical insulation thickness - Heat transfer from underground cables .
Extended surface heat transfer, fins - Free and forced convection - Empirical relations - Laws of radiation - Black body gray body - Radiation shape factor ~ Basic ideas of solar radiation

Module IV (13 hours)

Basic psychrometry - Principles of Air - conditioning, unit and central system - Air-conditioning processes -Power plant economics - Basic concepts - Load curve - Load duration curve - Selection of units and schedule of operation - Cost of energy - Depreciation and replacement - Tariff rate calculation

EE2K 404 : ELECTRONICS II

Module 1: Feedback Amplifiers, Stability & Oscillators - S-domain approach is envisaged (13 hours) Concept of feedback - Negative and positive feedback - Loop gain - Voltage series feedback on a single time constant voltage to voltage amplifier - Advantages of negative feedback in a single time constant voltage to voltage amplifier - Gain - Input and output resistances - Rise time - Band width - Nonlinearity etc - Stability and positive feedback in the above amplifier - Voltage shunt - Current series and current shunt topologies and properties.

Voltage series feedback on a second order amplifier -.Closed loop poles and loop gain Transient response of closed loop amplifier and loop gain - Voltage series amplifier with third order open

loop amplifier" Pole migration to right of s-plane - Bode plots of loop gain Barkhausen's criterion for stability of feedback amplifiers.. Gain margin and phase margin Introduction to amplifier compensation - Dominant pole compensation - Oscillators - Transistor phase shift oscillator - Wein's bridge oscillator ~

Module II: Linear Opamp Circuits (13 hours)

Operational amplifier - Ideal opamp properties - Properties of practical opamps (LM741, LM324, LM358, LF351 and OP07) - Different stages in an opamp - Internally compensated and externally compensated opamps - Slew rate - Offsets - Analysis of opamp circuits using ideal opamp model- Concept of virtual short and its relation to negative feedback – Offset model of a practical opamp - Non inverting amplifier - Gain bandwidth product - Voltage follower - Inverting amplifier - Summing amplifier - Offset analysis of non inverting and inverting amplifiers - Subtracting circuits - Instrumentation amplifier - Voltage to current converter for floating and grounded loads - Opamp integrator - Opamp differentiator - Series. voltage regulators - Monolithic regulators - Three terminal regulators

Module III: Nonlinear IC Applications (13 hours)

Regenerative comparator circuits using opamps - Comparator IC LM311 and its applications - Square, triangle and ramp generator circuits using opamps and comparator ICs - Effect of slew rate on waveform generation - Study of function generator IC ICL8038 - Principles of VCO circuits - Opamp based astable and monostable circuits - Precision half wave and full wave rectification using opamps - Log and anti-log amplifiers and applications - Analog multiplexer based on log/antilog amplifiers.- Phase locked loops -Principles - Lock and Capture ranges - Capture process - Loop filter - PLL dynamics under locked condition - Study of NE564 and CD4046 - Applications of PLL in signal reconstruction - Noise rejection - Frequency multiplication; Frequency synthesis - FSK demodulation - FM demodulation - Line synchronization etc. Timer - 555 applications

Module IV: Signal conditioning and signal conversion (13 hours)

Active filtering - Butterworth lowpass filter functions - Lowpass filter specifications - Order and cut off frequency of Butterworth function from lowpass specifications - Sallen and Key second order LP section - gain adjustment in Butterworth LP filters - Butterworth high pass filters - Second order wide band and narrow band bandpass filters - Multiple feedback single OPAMP LPF, HPF and BPF - Analog switches - Sample and hold amplifier - Data: conversion fundamentals - V_o/A conversion - Weighed resistor DAC- R/2R ladder DAC- Current switching DAC -Multiplying DAC - Bipolar DACs - A/D conversion - Quantiser characteristics - Single slope and dual slope ADCs - Counter ramp ADC - Tracking ADC - Successive approximation ADC - Simultaneous ADC

EE2K 405 : ELECTRICAL MACHINES I

Module I (10 hours)

Electromagnetic Machines: Fundamental principles - Classification - Generators, motors and transformers - Elements of electromagnetic machines - Armature windings - Commutator, winding - Lap winding and wave winding ~ Phase winding - Single phase winding and three phase winding - Single layer winding and double layer winding - MMF of a winding - Space harmonics - Torque developed in a winding - EMF developed in a winding - Distribution factor- Chording factor

Module II (12 hours)

DC Machines: Construction - Principle of operation - Magnetic circuit - Flux distribution curve in: the air-gap - EMF equation - Armature reaction- Demagnetising and cross magnetising ampere turns - Commutation - Methods of excitation - Generators and motors

Module III (14 hours)

DC Generators: Power flow diagram -Circuit model- Magnetisation characteristics - Process of voltage build up .. Terminal characteristics - Control of terminal voltage – Parallel operation - Applications .

DC Motors: Power flow diagram - Circuit model- Back EMF - Torque and speed equations - Performance characteristics, - Applications - Starting methods - Design of starters ~ Methods of speed control - Testing - Swinburne's test - Hopkinson's test - Separation of losses Retardation test - Permanent magnet DC motor

Module IV (16 hours)

Transformers: Types and construction - Principle of operation - Magnetising current..., Harmonics - Ideal and real transformer - Dot convention - Current and voltage ratio - Equivalent circuit -Phasor diagram - Per unit impedance- Losses - efficiency and regulation - All day efficiency - OC and SC tests - Sumpner's test - Parallel operation ~ Tap changing - Switching transients - Auto transformers - Voltage and current relationships - Saving of copper - Different connections of three phase transformers - Notations - Scott connection- Cooling methods .

EE2K 406: ELECTRICAL ENGINEERING MATERIAL SCIENCE

Module I (13 hours)

Conducting materials: Review of metallic conduction on the basis of free electron theory Fermi-Dirac distribution- Variation of conductivity with temperature and composition - Contact potential- Materials for electric resistances, brushes of electrical machines, lamp filaments, fuses and solder

semiconductors: Compound semiconductors - Basic ideas of amorphous and organic semiconductors .

Magnetic materials: Classification of magnetic materials - Origin of permanent magnetic dipoles - Ferrimagnetism - Hysteresis curve - Ferrimagnetic domains (qualitative explanation - only) - Curie - Weiss law.- Hard and soft magnetic materials, and applications - Ferrites Design of permanent and electromagnets - Magnetic materials used in electrical machines, instruments and relays

Module II (13 hours)

Dielectrics: Dielectric polarization under static fields - Derivation of the expression for electronic polarization in monoatomic gases .. Expressions for electronic, ionic and dipolar polarizations in polyatomic gases - Derivation of expression for polarization in solids and liquids -Clausius - Mossotti relation - Behaviour of dielectrics in alternating fields - Capacitance dielectric constant - Dipolar relaxation - Dielectric loss - Ferroelectricity - Main features Debye theory and explanation of hysteresis curve - (qualitative explanations only)

Module III (13 hours)

Dielectric breakdown: Mechanism of breakdown in gases, liquids and solids - Factors influencing dielectric strength - Capacitor materials .

Insulating materials: Good insulator properties and classification on temperature basis Common insulator materials used in electrical apparatus - Inorganic materials (Mica, glass, porcelain, asbestos) - Organic materials (Paper, rubber, cotton silk fibre, wood, plastics, bakelite) - Resins and varnishes - Liquid insulators (transformer oil) - Gaseous insulators (air, SF₆, and hydrogen) - Ageing of insulators .

Module IV (13 hours)

Solar energy materials: Photothermal conversion - Use of coatings for enhanced solar thermal energy collection - Solar selective coatings - Cold mirror coatings - Heat mirror coatings - Antireflection coatings - Photovoltaic conversion - Solar cells - Silicon, Cadmium sulphide and Gallium arsenide

Modern Techniques for Materials Studies: Optical microscopy - Electron microscopy Photoelectron spectroscopy - Atomic absorption spectroscopy - Magnetic resonance Nuclear magnetic resonance - Electron spin resonance - Ferrimagnetic resonance - Mossbauer spectroscopy

EE2K 407(P) MECHANICAL ENGINEERING LAB

1. Fluid mechanics lab - calibration of flow meters~ venturi meter, nozzle meter, orifice meter, notches- pipe friction- metacentric height
2. Hydraulic machinery lab- characteristics of turbines and pumps- Pelton, Francis turbines- centrifugal, reciprocating, gear pumps, hydrams
3. Heat engines lab: constant speed characteristics of engines- SI engines, CI engines air compressors, determination of viscosity, heat exchangers

EE2K 408(P) ELECTRICAL MEASUREMENTS LAB

1. Determination of B-H curve p - H curve and p - B curve of an iron ring specimen
2. Calibration of magnetic flux meter using standard solenoid and search coil and Hibbert's magnetic standard
3. Measurement of resistance using Wheat stone's bridge and Kelvin's double bridge
4. Measurement of self/mutual inductance and coupling coefficient of iron cored coil and air cored coil
5. Calibration of dynamometer type wattmeter, slide axis potentiometer/precision type vernier potentiometer
6. Extension of range of ammeter/voltmeter shunt/series resistance and calibration of the extended meters using standard ammeter/voltmeter
7. Extension of range of a dynamometer type wattmeter using CT IPT and calibration of the extended meter using a standard wattmeter
8. Calibration of single-phase energy meter by direct loading and phantom loading at various power factors
9. Calibration of 3 phase energy meter using standard wattmeter
10. Measurement of capacitance using Schering bridge
11. Determination of hysteresis loop of an iron ring specimen using 6 point method and CRO
12. Measurement of branch voltages in a series RLC circuit using A.C potentiometer

EE2K 501 : SOFTWARE ENGINEERING (common to all programmes)

Module I (13 hours)

Introduction: FAQs about software engineering - professional and ethical responsibility system modeling - system engineering process - *the software process* - life cycle models iteration - specification - design and implementation - validation - evolution - automated process support - *software requirements* - functional and non-functional requirements - user requirements - system requirements - SRS - *requirements engineering processes* - feasibility studies - elicitation and analysis - validation - management - *system models* - context models - behavior models - data models - object models - CASE workbenches

Module II (13 hours)

Software prototyping - prototyping in the software process - rapid prototyping techniques - *formal specification* - formal specification in the software process - interface specification - behavior specification - *architectural design* - system structuring - control models- modular decomposition - domain-specific architectures - distributed systems architecture - *object oriented design* - objects and classes - an object oriented design process case study design evolution - *real-time software design* - system design - real time executives - *design with reuse*, - component-based development - application families - design patterns - *user interface design* - design principles - user interaction - information presentation - user support - interface evaluation

Module III (13 hours)

Dependability - critical systems - availability and reliability - safety - security - critical systems specifications - critical system development ~. *verification and validation* - planning - software

inspection - automated static analysis - clean room software development *software testing* - defect testing - integration testing - object-oriented testing - testing workbenches - critical system validation - *software evolution* - legacy systems - software change - software maintenance - architectural evolution - software re-engineering ~ data re-engineer

Module IV (13 hours) ,

Software project management - project planning - scheduling - risk management - *managing people* - group working - choosing and keeping people - the people capability maturity model - *software cost estimation* - productivity estimation techniques - algorithmic cost modeling - project duration and staffing - *quality management* - quality assurance and standards - quality planning - quality control - software measurement and metrics - *process improvement* - process and product quality - process analysis and modeling - process measurement - process CMM - *configuration management*: planning - change management - version and release management - system building - CASE tools for configuration management .

EE2K 502 : ANALOG & DIGITAL COMMUNICATION SYSTEMS .

Module I (13 hours)

Frequency domain representation of finite energy signals and periodic signals... energy spectral density and power spectral density - convolution theorem - response of linear time invariant system - sampling and reconstruction - Nyquist sampling theorem - random processes - ensemble and time averages - Stationarity - correlation theory for wide sense stationary processes - Wiener-Khinchin-Einstein theorem - properties of Gaussian random processes - white noise - response of LTI system to white Gaussian noise

Module II (13 hours)

Amplitude modulation - spectrum- power relations - modulator and demodulator circuits AM transmitter block diagram - tuned radio frequency and superheterodyne receivers calculation of signal to noise ratio for envelope detection and coherent detection of AM principle of single side band suppressed carrier modulation - frequency modulation - deviation - modulation index - spectrum of FM signal- relationship between phase modulation and FM - JFET reactance modulator - FM transmitter block diagram - Foster Scelely discriminator - SNR calculation - pre-emphasis and de-emphasis . .

Module III (13 hours) . ,

Analog modulation scheme - PAM - PWM - PPM- digital pulse modulation scheme ~ PCM-DPCM and delta modulation - base band data transmission - base band transmission model - additive white gaussian noise channel- matched filter receiver - inter symbol interference basic ideas of pulse shaping - equalization - synchronization - scrambling and line coding digital pass band transmission.. elements of digital pass band transmission - pass band transmission model - coherent binary modulation schemes: ASK - PSK and FSK - multilevel signaling schemes - average probability of error - bit error rate - concept of an optimal receiver

Module IV (13 hours) ,

Elements of information theory - measure of information , - Shannon's source coding and channel coding theorems - discrete memory less channel- Shannon-Hartley theorem ...error control strategies - principles of forward error correction and ARQ - linear block codes and syndrome decoding - elements of data communication - transmission impairments - synchronous and asynchronous transmission - multiple access - FDM - synchronous and statistical TDM - CDMA- frequency hopped and direct sequence CDMA - computer networks network topologies - circuit switching - packet switching - basic concepts of network protocols - OSI

EE2K 503 : ELECTROMAGNETIC FIELD THEORY

Module I: The electric field (12 hours)

Co-ordinate transformation - vector fields - divergence theorem - Stokes theorem - static electric field - electric flux - Gauss's law - electric scalar potential - electric dipole moment.;
electric field polarization - condition at boundary between dielectrics, method of images - capacitance of isolated sphere - capacitance between co-axial cylinder - capacitance between parallel wires - energy density in static field - solution of Laplace's and Poisson's equation in electrostatics

Module II: The magnetic field (12 hours)

Magnetic field - steady magnetic field ~ conduction current - conduction current density Biot-Savart's law and ampere's law - vector potential concept of inductance - inductance of solenoid - toroid concept of resistance - magnetic moment - torque on a loop - transmission lines - electromagnetic induction; Faraday's law

Module III: Maxwell's equations (14 hours)

Continuity equation - displacement current - Maxwell's equation - plane waves - Poynting vector and Poynting's theorem - solutions for free space condition - wave equation for a conducting medium - harmonically varying field - wave polarization - linear - elliptic and circular polarization

Module IV: Waves and transmission lines (14 hours)

Wave equation on transmission line - co-axial and two wire transmission lines - phase velocity and group velocity - characteristic impedance - reflection coefficient ~ standing wave ratio - impedance matching - stub matching - Smith chart - reflection and transmission of plane wave at boundaries - continuity equation at boundaries - dielectric ~ dielectric boundary - dielectric - conductor boundary - law of reflection - law of refraction (Snell's law) - concept of Brewster's angle

EE2K 504 : PULSE & DIGITAL ELECTRONICS

Module I (13 hours)

Pulse circuits - forward recovery and reverse recovery of diodes - switching times of diode - switching behavior of transistors - switch-on time, components - resistive switching and clamped inductive switching of BJTs and switching times - storage time and Schottky BJTs - bistable circuit - symmetrical and asymmetrical triggering of bistable - collector coupled monostable - collector coupled astable - transistor Schmitt trigger circuit - voltage sweep errors - constant current sweep circuit - Miller sweep using opamps - current sweep generator

Module II (13 hours)

Logic families - ideal logic gates - truth tables of basic gates - logic levels - noise margin, basic Boolean algebra - De Morgan's theorems - DTL gates - HTL gates - TTL gates - standard TTL - Schottky TTL - ECL logic - MOS logic - NMOS logic gates - CMOS logic - tristate logic - comparison of logic families

Module III (13 hours)

Combinational circuits - number systems - Boolean functions - canonical and standard forms - simplification of Boolean functions by Karnaugh's map up to five variable map -

NAND; NOR, EX-OR & EX-NOR implementation - codes and code converters - multi level NAND circuits - multi level NOR circuits - adders - subtractors - signed and unsigned numbers ~ one's complement and two's complement - BCD adder - magnitude comparator BCD multiplier - decoders and encoders - multiplexers and demultiplexers - implementation of combinational logic by using multiplexers - ROM, PLA and PAL

Module IV (13 hours)

Sequential circuits and memories - flip flop & - RS, JK, T and D flip flops - triggering of flip flops - registers ~ shift registers - ripple counters - synchronous counters ~ ring counter Johnson counter - memories - ROM, static and dynamic RAM - read/write memory, EPROM, EEPROM, memory decoding - analysis of clocked sequential circuits - state tables and state diagrams - state

reduction and assignment - flip flop excitation tables - algorithmic state machine design procedure - design of mod- n counters - introduction to ASM charts

EE2K 505 : ELECTRICAL MACHINES II

Module I (12 hours)

Alternators - construction - principle of operation - type and selection - armature reaction voltage regulation - predetermination of voltage regulation - EMF method - synchronous reactance and short circuit ratio - MMF method - Potier method - phasor diagrams - two reaction theory - modified phasor diagram ~ analysis by two reaction theory - sudden short circuit - current waveforms - transient and subtransient reactances - slip test - DC excitation - static excitation - brushless excitation and self excitation - measurement of losses

Module II (14 hours)

Synchronous generator - power angle characteristics of cylindrical rotor and salient pole machines - reactance power - active and reactive power control - load sharing upon parallel operation - effect of armature reactance - automatic synchronizing - effect of change of fuel supply - alternator connected to infinite bus - governor characteristics - synchronizing power and torque - phasor diagram for two identical generators in parallel - locus of generated voltage for constant real power and variable excitation - automatic voltage regulators .

synchronous motor - principle of operation - equivalent circuit - effect of load changes on synchronous motor - mechanical load diagram - armature current as function of power developed and excitation - V curves - inverted V curves - O curves - transition of a machine from generator mode to motor mode - phasor diagram - torque and power relations - minimum excitation for given power - hunting - periodicity of hunting - suppression - different starting methods

Module III (12 hours)

Theory of induction machines - 3 phase induction motors - construction, principle of operation - rotor MMF and production of torque - slip and frequency of rotor current - phasor diagram - equivalent circuit - mechanical power developed - maximum torque - torque slip characteristics - losses and power flow - single phasing - no-load and blocked rotor tests - the circle diagram - effect of deep bar and double cage rotor - effects of air gap flux harmonics - cogging and crawling - line excited and self excited induction generators - single phase induction motors - double revolving field theory - equivalent circuit - principle of operation of linear induction motor - applications of all types of induction motors'

Module IV (14 hours)

Starting and speed control of induction motors - starting methods for three phase induction motors - direct on line starting - auto transformer starting - star delta starting - rotor resistance starting - starters and contactors - speed control - basic methods - voltage control frequency control - rotor resistance control - pole changing - static frequency conversion and slip power recovery scheme - starting methods of single phase induction motors generalised machine theory - diagrammatic representation of generalised machine - formation of emf equations - expressions for power and torque - representation of dc machine, synchronous machine and induction machine - formation of general equations'

EE2K506A: NUMERICAL ANALYSIS

Module I: Errors in numerical calculations (13 hours)

Sources of errors; significant digits and numerical instability - numerical solution of polynomial and transcendental equations - bisection method - method of false position - Newton Raphson method - fixed-point iteration - rate of convergence of these methods - iteration based on second degree equation - the Muller's method - Chebyshev method - Graeffe's root squaring method for polynomial equations - Bairstow's method for quadratic factors in the case of polynomial equations

Module II: Solutions of system of linear algebraic equations (13 hours)

Direct methods - Gauss and Gauss - Jordan methods ~ Crout's reduction method - error analysis - iterative methods - Jacobi's iteration - Gauss-Seidel iteration - the relaxation method - convergence analysis - solution of system of nonlinear equations by Newton-Raphson method - power method for the determination of eigen values - convergence of power method

Module III: Polynomial interpolation (13 hours)

Lagrange's interpolation polynomial - divided differences - Newton's divided difference interpolation polynomial - error of interpolation.. finite difference operators - Gregory Newton forward and backward interpolations - Stirling's interpolation formula - interpolation with a Cubic spline - numerical differentiation - differential formulas in the case of equally spaced points - numerical integration - trapezoidal and Simpson's rules - Gaussian integration - errors ~ integration formulas

Module IV: Numerical solution of ordinary differential equations (13 hours)

The Taylor series method - Euler and modified Euler methods - Runge-Kutta methods (2nd order and 4th order only) - multistep methods - Milne's predictor-corrector formulas - Adams-Bashforth & Adams-Moulton formulas - solution of boundary value problems in ordinary differential equations - finite difference methods for solving two dimensional Laplace's equation for a rectangular region - finite difference method of solving heat equation and wave equation with given initial and boundary conditions

EE2K 506B : ELECTRICAL NETWORK THEORY

Module I (15 hours)

Network functions for the one port and two port - poles and zeroes of network functions - restrictions on pole and zero locations for driving point functions - restrictions on pole and zero locations for transfer functions - time-domain behavior from the pole and zero plot - characterisation of two port in terms of impedance, admittance; hybrid and transmission parameters - relationships between parameters-interconnection of two ports - T and piequivalent of two port - image impedance - image transfer parameter

Module II (12 hours)

Symmetrical two port reactive networks as filters - attenuation and phase shifts in symmetrical networks - lattice filters.. low pass - high pass and band pass. filters - Brune's positive real functions - properties of positive real functions - properties of Hurwitz polynomials

Module III (13 hours)

Elementary synthesis operations - LC network synthesis - properties of RC network functions - Foster form of RC networks - properties of RL network functions - Foster form of RL networks - the Cauer form of RC and RL networks

Module IV (12 hours)

RLC one terminal-pair network synthesis - minimum positive real functions- Brune's method of RLC synthesis - the method of Bott and Duffin - two terminal - pair synthesis by ladder development - the LC ladder development - the RC ladder development

EE2K.506C : IDGH V. VOLTAGE ENGINEERING

Module I (13 hours)

pielectrics and dielectric breakdown - electric breakdown in gas and gas mixtures - break down in uniform and non-uniform fields- Paschen's law - Townsend criterion - penning effect - streamer mechanism - corona discharge - electronegative gas - breakdown in surge voltage - time lag - practical consideration in using gases for insulation purposes - break..

breakdown in high vacuum - breakdown in liquid dielectrics - pure liquids and commercial liquids .. electronic and cavitation breakdown - suspended particle mechanism - breakdown in solid dielectrics - intrinsic - electromechanical- steamer and thermal breakdown - treeing phenomenon - partial discharge- breakdown of composite dielectrics

Module II (13 hours)

Generation of high voltages and currents - DC voltages - voltage doubler - cascade circuits - electrostatic machines - voltage stabilization - AC voltages - cascade transformers - series resonance circuits - impulse voltages - single stage and multistage circuits - wave shaping - tripping and control of impulse generators - synchronization with oscilloscope - generation of switching surge voltage.. generation of impulse currents

Module III (13 hours)

Measurement of high voltages and currents - DC, AC and impulse voltages and currents CRO-electrostatic generating and peak voltmeters, sphere gaps - factors affecting measurements - potential dividers (capacitive and resistive) - series impedance ammeters - Rogoski coils - magnetic links - hall effect generators - PT's (magnetic and capacitive types) and CT's

Module IV (13 hours)

ii. V. testing of materials and apparatus - acceptance - preventive and diagnostic tests 'dielectric loss measurements - Schering bridge" inductively coupled ratio arm bridge - loss measurement, complete equipment - partial discharge and ratio interference measurements - over voltage phenomenon and insulation co-ordination - traveling waves - line equations wave transmission.. reflection and attenuation - lightning phenomenon - switching surges principles of insulation - co-ordination on HV and EHV systems - protection against surges - system grounding

EE2K 506D : DIGITAL SYSTEM DESIGN

Module I (13 hours)

Finite state machine design - the concept of state machine - timing in state machine – FSM design procedure ~ ASM notation - Moore and Mealy machine design - examples of Moore and Mealy machines - finite state machine word problems

Module II (13 hours)

Asynchronous design - asynchronous ASM - asynchronous system - design principles - problem of asynchronous circuits - hazards - critical races - examples

Module III (13 hours)

Designing with programmable devices - programmable LSI techniques - PLA - logic cell array and antifuse 'FPGAs - designing with FPGAs - large PAL structures - MAX and XC7000 EPLDs - RAM based FPGAs - FLEX8000/10K families - selecting and using FPGAs.

Module IV (13 hours)

Hardware description languages - introduction to VHDL - behavioral modeling - transport vs inertial delay - simulation deltas - sequential processing - process state element - signal assignment vs variable assignment - sequential statements - data types - subprograms and packages - predefined attributes - configurations - subprogram overloading - VHDL synthesis design examples

CS2K 506E : OBJECT ORIENTED PROGRAMMING (common for all programmes)

Module I (2 hours)

OOPS and Java basics - Java virtual machine - Java platform API - extended security model - applet classes - exceptions and abstract classes - Java applet writing basics - GUI building with canvas - applet security - creating window applications - writing console applications utility and math packages

Module II (10 hours)

Swing programming - working with swing components - using the clipboard - input/output streams - printing - working with 2D and 3D Graphics - using audio and video - creating animations

Module III (10 hours)

Java beans development kit - developing beans - notable beans - network programming client and server Programs - naming and directory services- working with Java management APIs

Module IV (20 hours).

Distributed application architecture - CORBA ~ RMI and distributed applications - working with remote objects - object serialization and Javaspaces - Java IDL and ORBs, connecting to database - using JDBC - integrating database - support into web applications - Java servlets
. JSDK - JAR files - Java native interface

EE2K 507(P) : ELECTRONICS LAB II

1. OPAMP circuits - design and set up of inverter - scale changer - adder - non-inverting amplifier - integrator and differentiator
2. OPAMP comparator - design and set up of Schmitt trigger - window comparator
3. Phase shift and Wein's bridge oscillator with amplitude stabilization using OPAMPs
4. Waveform generation - square, triangular and sawtooth waveform generation using OPAMPs
5. Precision rectification - absolute value and averaging circuit using OPAMPs
6. Second order LP and BP filters using single OPAMP
7. Using CD 4046 (PLL), study the dynamics of set up (a) Frequency multiplier (b) FSK MOD/DEMODO using PLL
8. Set up analog to digital converter (a) successive approximation method (b) digital slope method
9. Using UP/DOWN COUNTER and a DAC ICs, generate triangular waveform . a) Using Cd 40447 IC design and set up gated/ungated astable and monostable multivibrators'.
b) Using Cd 4093 Schmitt NAND IC design and set up astable and monostable
10. Design of Half adder and half subtractor circuits with NAND gates using mode control
- a) Design and realization of ripple counter using JK flip-flop
- b) Cascading of ripple counters
11. Design and realization of Johnson & Ring counter using (a) JK flip flop (b) shift register
12. Synchronous UP/DOWN counter design and realization.
13. IC 555 applications

EE2K 508(P) : ELECTRICAL MACHINES LAB I

DC Machine

1. Obtain the open circuit characteristic at rated speed
(a) Predetermine the OCC at different speeds
(b) Find the critical resistance and the critical speed for a given field circuit resistance
2. Load test on DC shunt generator
(a) The performance characteristics by conducting load test
(b) Deduce the armature reaction curve
(c) Break test on Dc shunt and series motor

Objectives

- Plot the following characteristics
- i) Output v Efficiency
 - ii) Output v Line current.
 - iii) Output v Speed
 - iv) Speed vs Torque
 - v) Line current vs Torque
3. Perform Swinburne's test on a DC shunt machine

Objectives

- predetermine the armature current and percentage efficiency when the machine operates as a motor and as a generator delivering 1/4, 1/2, 3/4 and full rated output
4. Hopkinson's Test on a pair of DC machines

Objectives

Predetermination of the efficiency of the machine working as a motor and generator under various load conditions on the generator

5. Perform Retardation test on a DC machine

Objectives

i) Separate the losses

ii. Find the moment of inertia of the rotating system

6. By conducting a no load test at different excitations on DC shunt motors

Objectives

Plot the efficiency vs output and % regulation vs output characteristics

7. O.C and S.C test on the single-phase transformer -pre-determination of the following

Objectives

i. Efficiency at 1/4, 1/2, 3/4 and full loads at 0.5, 0.86 and unity p.f.

ii. Regulation at same loads and p.f.

iii. Equivalent circuit referred to HV and LV sides

iv. Upload at which efficiency is minimum

8. At normal voltage and frequency separate the hysteresis and eddy current losses of a single phase transformer

9. Conducting Sumpner's test

Objectives

Predetermination of efficiency and regulation at various loads and p.f.

10. Scott connection of the single phase transformers to find performance under various load conditions at upf and plotting the efficiency curves with

(a) Main transformer secondary alone loaded

(b) Teaser transformer secondary alone loaded

(c) Balanced loading

(d) Unbalanced loading

EE2K 601 : MICROPROCESSORS & MICRO CONTROLLERS

Module I (15 hours)

Intel 8086 processor - architecture - memory addressing - addressing modes - instruction set - assembly language programming .. assemblers -. interrupts - pin configuration - timing diagrams - minimum and maximum mode - multiprocessor configuration

Module II (12 hours)

Interfacing - address decoding - interfacing chips - programmable peripheral interface (8255) - programmable communication interface (8251) - programmable timer (8253) - DMA controller (8259) - programmable interrupt controller (8257) - keyboard display interface (8279)

Module III (12 hours)

Introduction to 80386 - memory management unit - descriptors, selectors, description tables and TSS - real and protected mode - memory paging - special features of the pentium processor - branch prediction logic - superscalar architecture

Module IV (13 hours)

Intel 80196 microcontroller - CPU operation - memory space - software overview - peripheral overview - interrupts - PWM timers - high speed inputs and outputs - serial port - special modes of operation.

EE2K 602: POWER ELECTRONICS

Module I (13 hours)

Power diodes - basic structure and V-I characteristics - various types - power transistors

BJT, MOSFET and IGBT - basic structure and V-I characteristics - thyristors - basic structure

- static and dynamic characteristics - device specifications and ratings - methods of turning on - gate triggering circuit using UJT - methods of turning off - commutation circuits - TRIAC

Module II (13 hours)

Line frequency phase controlled rectifiers using SCR - single phase rectifier with R and RL loads - half controlled and fully controlled converters with continuous and constant currents - SCR inverters - circuits for single phase inverters - series, parallel and bridge inverters - pulse width modulated inverters - basic circuit operation

Module III (12 hours)

AC regulators - single phase ac regulator with R and RL loads - sequence control of ac regulators - cycloconverter - basic principle of operation - single phase to single phase cycloconverter - choppers - principle of operation - step-up and step-down choppers - speed control of DC motors and induction motors

Module IV (14 hours)

switching regulators - buck regulators - boost regulators - buck-boost regulators - cuk regulators - switched mode power supply - principle of operation and analysis - comparison with linear power supply - uninterruptible power supply - basic circuit operation - different configurations - characteristics and applications

EE2K 683 : CONTROL SYSTEMS I

Module I (14 hours)

System models - continuous time - principles of automatic control - open loop and closed loop systems - practical examples - transfer function approach - impulse response and transfer function - transfer matrix - determination of transfer functions of simple electrical & mechanical systems and control system components - analogous systems - block diagram reduction - signal flow graphs - Mason's gain formula - concept of state - state variable representations for continuous time systems - transfer function from the state variable model and vice versa - transfer function decomposition for different state models - diagonalisation - state diagrams.

Module II (12 hours)

System models - discrete time - sample data control systems - sampling process - mathematical analysis of the sampling process - data reconstruction and hold circuits - zero and first order hold - z-transform - inverse z-transform - solution of difference equations - pulse transfer function - system time response - discrete time state equations - z-transform decomposition - discrete time state models

Module III (14 hours)

Time domain analysis - test signals - response of systems to standard test signals - step response of second order systems - time domain specifications - steady state response steady state error - static & dynamic error coefficients - solution of linear time invariant state equation - state transition matrix - properties - computational methods - complete solution Solution of the discrete state equation - stability of linear systems - Routh's criterion of stability - stability in the z-plane - bilinear transformation and the w-plane - Routh's stability criterion for discrete data systems - Jury's stability test - Root locus method - construction of Root locus - effect of poles and zeros and their locations on the root locus - extension to discrete data systems

Module IV (12 hours)

Frequency domain analysis - frequency response representation - polar plot - logarithmic plots - frequency domain specifications - non-minimum phase systems - transportation lag - Nyquist stability criterion - stability from polar and Bode plots - relative stability - gain margin and phase margin - M-N circles - Nichol's chart - frequency response of discrete data systems - extension of frequency response methods to discrete-data systems

EE2K604.: POWER SYSTEMS I

Module I (13 hours)

Conventional sources of electrical energy - thermal, hydroelectric, diesel and nuclear power plants - introduction to renewable energy sources - solar, wind, geothermal~ tidal, magneto hydro dynamic and fuel cell power generation - power plant economics - operating costs load factor - demand factor - diversity factor - plant factor - depreciation - tariff - economics of power factor improvement - capacity of phase advancing plant

Module II (13 hours)

overhead transmission systems - arrangement of conductors - calculation of sag and tension - sag template - transmission line supports and their location, economic span - choice of transmission voltage - line insulation types - string efficiency - impulse ratio - arcing horns and rings - failure of insulation - corona - disruptive critical voltage - advantages and disadvantages of corona - underground cables - different types - insulation resistance - capacitance of single core cables - grading of cables - capacitance of three core cables – sheath effects - laying and testing of cables

Module III (13 hours)

Distribution systems - classification and arrangement of distribution systems - distribution substation layout and arrangement - economic loading of distribution transformers - design of feeders - Kelvin's law - considerations in primary and secondary distribution system design - current distribution and voltage drop in single-phase and three phase four-wire distribution systems - voltage drop calculation and design of distributors in ring system improvement of existing distribution systems - LT capacitor installation - size and connection

Module IV (13 hours)

Performance of transmission lines - calculation of transmission line inductance and capacitance - GMD and GMR - bundled conductors - transposition - representation of short medium and long lines - ABCD constants - rigorous solution of long lines.. effect of capacitance - nominal T and π methods of calculations - power flow through a transmission line

EE2K 605 : ELECTRICAL ENGINEERING DRAWING

Module I (6 hours)

Developed winding diagrams using AUTOCAD

1. Simplex lap and wave dc armature windings
2. Simplex lap and wave, integral and fractional slot, double layer three phase ac armature windings ..
3. Mush and concentric type single layer three phase ac armature windings
(Questions from this module are not included for the exam)

Module II (10 hours)

Transformers

1. Sectional plan and elevation of a transformer limb with windings
- 2 Sectional plan and elevation of the core assembly of a power transformer
- 3.. Sectional plan and elevation of a distribution transformer tank with its accessories
4. Sketches of capacitor and oil filled type transformer bushings

Module III (8 hours)

Substation layouts

1. Layouts and single line diagrams of outdoor and indoor substations
- 2 Layout of a 220KV substation
3. Layout of a captive power substation
4. Single line diagram of a distribution centre

Module IV (28 hours)

DC Machines:

1. Sectional and side elevation. of armature with commutator of a dc machine.
- 2 Sectional front and side elevation of the yoke and pole assembly with field winding of a dc machine

3. Sectional front and side elevation of an assembled dc Machine

Alternators:

1. Sectional front and side elevation of a water wheel motor assembly with winding
2. Sectional front and side elevation of a salient pole alternator
3. Sectional front and side elevation of a turbo alternator
4. Sketches of the methods of pole fixing and slot details of turbo and water wheel alternators

Induction motors:

1. Sectional front and side elevation of a slip ring induction motor
2. Sectional front and side elevation of a squirrel cage induction motor

EE2K606A:OPTIMIZATION. TECHNIQUES

Module I: Linear programming I (13 hours)

Systems of linear equations and inequalities - convex sets - convex functions - formulation of linear programming problems - theory of simplex method - simplex algorithm - Charnes's M method - two phase method - duality in linear programming: dual simplex method

Module II: Linear programming II (13 hours)

Sensitivity analysis - parametric programming - bounded variable problems - transportation problem - development of the method - integrality property - degeneracy - unbalanced problems - assignment problem - development of the Hungarian method - routing problems

Module III: Nonlinear programming (13 hours)

Mathematical preliminaries of non-linear programming - gradient and Hessian - unimodal functions - convex programming - separable convex programming - Frank and Wolfe method

Module IV: Dynamic programming & game theory (13 hours)

Nature of dynamic programming problem - Bellman's optimality principle - cargo loading problem - replacement problems - multistage production planning and allocation problems - rectangular games - two person zero sum games - pure and mixed strategies - 2xm and mx2 games - relation between theory of games and linear programming

EE2K 606B : SPECIAL MACHINES & LINEAR MACHINES

Module I (13 hours)

Servo motors - symmetrical components applied to two - phase servo motors - equivalent circuit and performance based on symmetrical components - servo motor torque - speed curves

Module II (13 hours)

Stepper motors - construction features - method of operation - drive amplifiers and transistor logic - half stepping and the required switching sequence - the reluctance type stepper motor - ratings and other characteristics

Module III (13 hours)

Reluctance motors - general - types of synchronous motors - reluctance motors - definitions - construction - polyphase and split phase reluctance motors - capacitor type reluctance motors - hysteresis motors - construction - polyphase - capacitor type and shaded pole hysteresis motors - universal motors - universal motors - application and torque characteristics - essential parts of universal motors

Module IV (13 hours)

Linear machines - basic difference between LEMS and rotating machine - classification of LEMS, linear motors and levitation machines - linear induction motors - linear synchronous motors - DC linear motors - linear levitation machines

EE2K 606C : DATA STRUCTURES & ALGORITHMS

Module I (12 hours)

Review of data types - scalar types - primitive types - enumerated types - subranges structures types - character strings - arrays - records - sets - files- data abstraction - complexity of algorithms - *time* and space complexity of algorithms using "big oh" notation - *recursion* recursive algorithms - analysis of recursive algorithms

Module II (12 hours)

Linear data structures - stacks - queues - lists - stack and queue implementation using array - linked list - linked list implementation using pointers

Module III (12 hours)

Nonlinear structures - graphs - trees - sets - graph and tree implementation using array linked list - set implementation using bit string, linked list

Module IV (16 hours)

Searching - sequential search - searching arrays and linked lists - binary search - searching arrays and binary search trees - hashing - introduction to simple hash functions - resolution of collisions - sorting: n² sorts - bubble sort - insertion sort - selection sort - NlogN sorts quick sort- heap sort - merge sort - external sort - merge files

EE2K 606D : CELLULAR & MOBILE COMMUNICATION SYSTEMS

Module I: Introduction to cellular mobile systems (14 hours)

A basic cellular system - operation of cellular systems - concept of frequency reuse - cell splitting - analog systems - mobile stations - cell site antennas & mobile antennas - co channel interference reduction - channel assignment - doppler frequency shift - hand off and dropped cells

Module II: Digital systems (13 hours)

Introduction to digital systems - digital speech - digital mobile telephony - multiple access schemes - global systems for mobile (GSM) - TDMA and CDMA systems -third generation systems - WCDMA

Module III: Intelligent networks and signal processing (13 hours),

. Application of intelligent micro cell systems - indoor communications - CDMA cellular radio network - advanced intelligent network(AIN) array - Processing principles & smart antennas - signal processing for wireless communication - channel estimation - blind detection - multi user detection

Module IV Digital modulation & coding (12 hours)

Basic digital modulation techniques - coherent and non-coherent modulation - error - correction and detection for. wireless communication - PN codes - synchronisation of spread spectrum systems ~" radio channel models - diversity techniques for wireless systems

EE2K 606E : ELECTRICAL MACHINE DESIGN

Module I (14 hours)

DC machines - output equation - main dimensions - choice of specific electric and magnetic loadings - choice of speed and number of poles - design of armature conductors, slots and winding - design of air-gap, field system, commutator, interpoles, compensating winding and brushes - Carter's coefficient - real and apparent flux density.. design examples"

Module II (14 hours)

Transformers - single phase and three phase power transformers - output equation - main dimensions - choice of specific electric and magnetic loadings- design of core, LV winding, HV winding, tank and cooling tubes - prediction of no load current, forces on winding during short circuit, leakage reactance and equivalent circuit based on design data - design examples - design principle..s of current transformers - temperature rise calculations - continuous and intermittent rating

Module III (12 hours)

Alternators - salient pole and turbo alternators - output equation - main dimensions - choice of specific electric and magnetic loadings - choice of speed and number of poles - design of armature conductors, slots and winding - design of air-gap, field system and damper winding - prediction of open circuit characteristics and regulation of the alternator based on design data - design examples

Module IV (12 hours)

Induction machines - output equation - main dimensions - choice of specific electric and magnetic loadings - design of stator and rotor windings, stator and rotor slots and air-gap of slip ring and squirrel cage motors., calculation of rotor bar and end ring currents in cage rotor ~ calculation of equivalent circuit parameters and prediction of magnetising current based on design data - design examples

EE2K 606F : COMPUTER ARCHITECTURE & ORGANISATION

Module I (13 hours)

Computer abstraction and technology- basic principles- historical perspective - measuring performance - relating the metrics, evaluating, comparing and summarizing performance case study: SPEC95 benchmark - instructions - operations and operands of the computer hardware - representing instructions -making decision - supporting"procedures"- beyond numbers - other styles of addressing - starting a program - case study" 80x86 instructions

Module II (13 hours)

Computer arithmetic - signed and unsigned numbers - addition and subtraction - logical operations - constructing an ALU - multiplication and division - floating point - case study - floating point in 80x86 - the processor - building a data path - simple and multicycle implementations - microprogramming - exceptions - case study - pentium pro implementation

Module III (14 hours)

Pipelining - overview - pipelined datapath - control- pipeline hazards - exceptions - superscalar and dynamic pipelining -case study - Pentium pro pipeline.- memory hierarchy - caches cache performance - virtual memory - common framework for memory hierarchies - case study - Pentium pro memory hierarchy

Module IV (12 hours)

Input/output - I/O performance measures, types and characteristics of I/O devices - buses-interfaces in I/O devices - design of an I/O system - multiprocessors - programming - bus and network connected multiprocessors - clusters - network topologies

EE2K 607(1) : ELECTRICAL MACHINES LAB II

3 Phase Induction Motors

1. No load and blocked rotor test on 3 phase squirrel cage induction motor and slip ring' induction motor.

i Conduct no load blocked rotor tests on both types.ofmlcs

ii. Determine the equivalent circuit parameters and draw the equivalent circuit

iii. Draw the circle diagram and there from predetermine the performance characteristics'

2. Load test on 3 phase squirrel cage and slip ring induction motor

i Conduct the brake test on both types of machines

ii. Obtain and plot the various performance characteristics

iii. Find the KYAr required to improve the power factor to 0.95 at various loads and find the relation

3.Performance ofInduction machine as a generator and motOr

i. To operate the given 3 phase induction machine coupled with de machine as

ii An Induction motor

iii. An Induction generator' working in supply mains

- iv. To conduct load test in both generating and motoring modes and plot the following characteristics on the same graph - efficiency, line current, power factor and slip as a function of output power
4. Pole changing speed control and load test on pole changing induction motor as a method of Plot output vs slip and obtain hysteresis, power and corresponding torque induction motor
- i. To study the different modes of operation of three phase pole changing induction motor
 - ii. Perform load test and obtain the performance characteristics and compare the results obtained for different pole combinations at different load condition groups consisting of three to five students
- The assessment of all the mini projects shall be done by a committee consisting of three or four faculty members specialised in the various fields of electrical engineering - the students will present their project work before the committee - the group average marks for the various projects will be fixed by the committee - the guides will award the marks for the individual students in a project maintaining the group average - each group will prepare the project report and submit to the department through the guide - the head of the department will certify the copies and shall retain one copy in the departmental library

EE2K 701 : INDUSTRIAL MANAGEMENT

Module I (13 hours)

Principles of management - management functions - planning - organising - organisation structures - span of control - delegation - directing - leadership and motivation - controlling - decision making - single stage decision making under risk - multistage decision making decision tree - decision making under uncertainty - equally likely, minimax and maximin criteria

Module II (14 hours)

Operation management - production systems and functions - product design and selection. - concept of total quality management and ISO 9000 system of standards. concept of supply chain management - project management - projects and management - network analysis - critical path method (CPM) network - finding critical path - slacks - crashing (time-cost trade off) - PERT network

Module III (12 hours)

Marketing management - concept of market and marketing - marketing function.. marketing mix.. market research.. advertising and sales promotion - human resources management manpower requirement analysis - recruitment and training - job analysis - job evaluation wages and incentives

Module IV (13 hours)

Financial management - objectives/functions. - concept of time value of money - basics of financial accounting - profit and loss account - balance sheet - costing - elements of costs cost sheet - allocation of overheads - break-even analysis depreciation - significance and methods of depreciation.

EE2K 702 : DIGITAL SIGNAL PROCESSING

Module I (12 hours)

Discrete signals - sequences - linear shift - invariant systems - stability and causality difference equations - frequency domain representations - Fourier transform and its properties - sampling of continuous - time signals.. Z transforms - inverse Z transforms - theorems bilinear transformation

Module II (15 hours)

Representation of discrete Fourier series - properties of discrete Fourier series - discrete Fourier transforms - properties of DFT - linear convolution using DFT - overlap-add method - overlap-save method - FFT - Rader's DFT FFT algorithm - Rader's DFT FFT algorithm butterfly structure - bit reversed order - in-place computations

Module III (10 hours)

Transfer function representations - discrete state variables - matrix vector representation - lattice-ladder structures - parameter quantisation effects - DSP chips - architecture of fixed point and floating point DSP cores (schematics only)

Module IV (15 hours)

Digital filter design techniques - design of IIR filters from analog filters - analog to digital transformation - backward difference and forward difference approximations - impulse invariant transformation - bilinear transformation - prewarping - analog Butterworth function for various filters - design example - properties of FIR filters - design of FIR filters using windows - comparison of IIR and FIR filters - finite word length effect in DSP

EE2K 705A : BIOMEDICAL INSTRUMENTATION

Module I (13 hours)

Electrical activity of excitable cells - SO curve - functional organization of the peripheral nervous system - electrocardiogram (in detail with all lead systems) - electroencephalogram - electromyogram - electroneurogram - electrode - electrolyte interface - polarisable and non polarisable electrodes - surface electrodes - needle electrodes - micro electrodes - practical hints for using electrodes - 'skin-electrode' equivalent circuit - characteristics of 'bio-amplifiers'

Module II (13 hours)

Blood pressure - direct measurements - harmonic analysis of blood pressure waveform systems for measuring venous pressure - heart sounds - phonocardiography - cardiac catheterisation - indirect blood pressure measurement - electromagnetic blood flow meters ultrasonic blood flow meters - impedance plethysmography - photo plethysmography 'indicator-dilution' method for blood flow determination - spirometry - measurement of various respiratory parameters - respiratory plethysmography - chamber plethysmography

Module III (13 hours)

Measurement of gas flow rate - cardiac pacemakers and other electric stimulators - defibrillators and cardio converters - blood pumps - hemodialysis - ventilators - infant incubators ~ drug delivery devices.. 'lithotripsy' - therapeutic applications of laser

Module IV (13 hours)

Physiological effects of electricity - important susceptibility parameters - macro shock hazards - micro shock hazards - protection against shock - electrical isolation - electrical safety analyzers - measurement of pH, PCO₂ and PO₂

EE2K 705B : INDUSTRIAL PSYCHOLOGY

Module I (13 hours)

Introduction - psychology as a science - areas of applications - study of individual - individual differences - study of behavior - stimulus - response behavior - heredity and environment - human mind - cognition - character - thinking - attention - memory - emotion - traits attitude - personality

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Module II (13 hours)

Organizational behavior - definition - development - fundamental concept - nature of people - nature of organization - an organizational behavior system - models - autocratic model hybrid model - understanding a social - system social culture - managing communication downward, upward and other forms of communication

Module III (13 hours)

Motivation - motivation driver - human needs - behavior modification - goal setting - expectancy model - comparison models - interpreting motivational models - leadership - path goal model - style - contingency approach

Module IV (13 hours)

Special topics in industrial psychology - managing group in organization - group and inter group dynamics - managing change and organizational development - nature planned change - resistance,;, characteristic of OD - 00 process

EE2K 705C : ARTIFICIAL INTELLIGENCE & EXPERT SYS.. TEMS

Module I (16 hours)

. Definition - history and applications - propositional calculus - predicate calculus - inference rules - structures and strategies for state space search ~ heuristic search algorithms - heuristics in games - complexity issues - control and implementation of state space search - production systems - planning - the blackboard architecture

Module II (14 hours)

Knowledge intensive problem solving - expert system technology - rule-based expert systems - model based reasoning- case based reasoning ~ knowledge representation problem reasoning with uncertain or incomplete information - statistical approach - non-monotonic systems - fuzzy sets' - knowledge representation - languages - issues - network representation - conceptual graphs - structured representation

Module III (12 hours)

Languages and programming techniques for AI - overview of LISP - search - higher order functions and procedural abstractions - search strategies - pattern matching - recursion in PWM inverters - square wave pulse switching- programmed hannonic elimination switching - current regulated modulation - Single Phase Switched Mode Rectifier and its control Single phase utility interface - input current hannonic considerations - single phase boost type. active power factor correction stage - basic operation - waveforms - current control strategies.. output voltage control - power limits - power circuit design considerations study of popular PFC Control ICs MC34062 and DC 3854

Module IV (13 hours)

Introduction to modeling of switched mode power supplies - state space averaging - state space averaged models - equivalent circuits and small signal transfer functions for basic converters Introduction to resonant converters - classification of resonant converters - basic resonant circuit concepts - load resonant converter - resonant switch converter - zero voltage switching clamped voltage topologies - resonant DC link inverters with zero voltage switching high frequency link integral half cycle converter

EE2K 705E : COMPUTER .NETWORKS

Module I (13 hours)

Computer networks - local area networks - wired LANs - Ethernet - token ring - token bus - wireless LAN protocols - high speed and bridged LANs - fast Ethernet - IEEE 802~ 12 - FOOI - bridges

Module U (13 hours)

Wide area networks - characteristics - packet switched networks - circuit switched networks - ISDN - private networks - internetworking - architecture - internetworking issues - internet protocol standards - IP and IPv6

Module III (13 hours)

Transport protocols - user datagram protocol - transmission control protocol - protocol specification - transport layer - service definition

Module IV (13 hours)

Session layer - presentation layer - data encryption - presentation protocol - remote operations service element - commit}lent - concurrency and recovery - TCP/IP application protocol ., directory service

EE2K 705F : ENTREPRENEURSHIP

Module I (20 hours)

Entrepreneurial perspectives - understanding of entrepreneurship process - entrepreneurial decision process - entrepreneurship and economic development.. characteristics of entrepreneur - entrepreneurial competencies - managerial functions for enterprise

Module II (10 hours)

Process of business opportunity identification and evaluation - industrial policy - environment - market survey and market assessment - project report preparation - study of feasibility and viability of a project - assessment of risk in the industry

Module III (12 hours)

Process and strategies for starting a venture - stages of small business growth - entrepreneurship in international environment - entrepreneurship - achievement motivation - time management creativity and innovation structure of the enterprise - planning, implementation and growth.

Module IV (10 hours)

Technology acquisition for small units - formalities to be completed for setting up a small scale unit - forms of organizations for small scale units - financing of project and working capital - venture capital and other equity assistance available - break even analysis and

EE2K 705G : ELECTRICAL MACHINE MODELLING & ANALYSIS

Module I: Modeling and analysis of DC machines (15 hours)

Electrodynamical equations and their solution - a spring and plunger system - rotational motion system - mutually coupled coils - Lagrange's equation - application of Lagrange's equation to electromechanical systems - solution of electrodynamical equations by Euler's method and Runge-Kutta method - linearisation of the dynamic equations and small signal stability - *the primitive 4 winding commutator machine* - the commutator primitive machine the brush axis and its significance - self and mutually induced voltages in the stationary and commutator windings - speed e.m.f induced in commutator winding - rotational inductance coefficients - sign of speed e.m.f terms in the voltage equation - the complete voltage equation of primitive 4 winding commutator machine - the torque equation - *DC Machines* analysis of simple DC machines using the primitive machine equations - analysis of crossfield DC machines using the primitive machine equations

Module II: Modeling and analysis of induction motors (13 hours)

The three phase induction motor - equivalent two phase machine by m.m.f equivalence - , equivalent two phase machine currents from three phase machine currents - power invariant phase transformation - voltage transformation - voltage and torque equations of the equivalent two phase machine - commutator transformation and its interpretation - transformed equations - different reference frames for induction motor analysis - choice of reference frame - nonlinearities in machine equations - equations under steady state - solution of large signal transients in an induction machine - linearised equations, of induction machine in current variables and flux linkage variables: 'small signal stability - eigen values - transfer function formulation - application of large signal and small signal equations

Module III: Modeling and analysis of synchronous machines (13 hours)

The three phase salient pole synchronous machine - three phase to two phase transformation - voltage and torque equations in stator, rotor and air-gap field reference frames commutator transformation and transformed equations - park's transformation - suitability of reference frame Vs-kind of analysis to be carried out - steady state analysis - large signal transient analysis - linearisation and eigen value analysis - general equations for small oscillations - small oscillation equations in state variable form - damping and synchronizing torques in small oscillation stability analysis - application of small oscillation models in power system dynamics

Module IV: Dynamical analysis of interconnected machines (11 hours)

Machine interconnection matrices - transformation of voltage' and torque equations using interconnection matrix -large signal transient analysis using transformed equations - small signal model using transformed equations - the DC generator/DC motor system - the alternator/synchronous motor system - the Ward-Leonard system - hunting analysis of interconnected machines - selection of proper reference frames for individual machines in an interconnected system

EE2K 706(P) : ADVANCED ELECTRICAL ENGINEERING LAB I

1. MATLAB- I - experiments using MTLAB tool box
- 2; Determination of transfer function of DC motor (a) armature control (b) field control 3. Study and experiments on (a) DC servo motor (b) AC servo motor
4. Exp~riments on synchros (a) characteristics (b) data transmission (b) error detection (d) differential synchro .
5. Determination of transfer function of the amplidyne ~nd load characteristics
6. Design and experimental determination of frequency response determination of lag, lead and lag-lead networks .
7. Magnetic amplifier - characteristics and control circuits
8. Static and dynamic performance evaluation of transducer (a) resistance thermometer (b) vibration pick up (c) pRmeter
9. Study and performance evaluation of transducers (a) strain gauge (b) inductive pick up (c) capacitive pick up (d) L VDT .
10. Study and experiments on pneumatic control system .
11. Microprocessor based generation of non-linear functions using proper interfacing and display devices .
12. PSPICE simulation of single phase and three phase diode bridge rectifiers 13.PSPICE simulation of three phase thyristor bridge rectifier
14. Power flow analysis of the system with the given single line diagram, using the given I power flow analysis package
15. Fault analysis of the system with the given single line diagram, using the given fault analysis package. Obtain the sub-transient fault currents for DLFG, DLFG, LLF faults at each bus
16. Determination of relay characteristics

EE2K 707(P) : SEMINAR

Individual students should be asked to choose a topic in a field of their interest but in electrical & electronics engineering, preferably from outside the B.Tech syllabus and give a seminar on that topic for about thirty minutes - a committee consisting of atleast three faculty

.. members (preferably specialized in different fields of engineering) shall assess the presentation of the seminars and award the marks to the students based on the merits of the tOpI'- of . 68'

presentation - each student shall submit two copies of a write up of his seminar talk - one copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other will be kept in the departmental library

EE2K 708(P) : PROJECT

The project work can be a design project - experimental project - investigation or computer oriented on any of the topics of electrical or electronics interest - it can be allotted as a group project consisting of a maximum number of five students - the topic of the project for any student should be different from his/her mini project

The interim assessment of all the projects should be done at the end of the seventh semester by a committee consisting of three or four faculty members specialized in the various fields of electrical engineering - the students shall present their project work before the committee for about 20 to 30 minutes duration - the complete project report is not expected at the end of the seventh semester - however a three to four page abstract based on the work done should be submitted by the students to the assessing committee. The group average marks for the various projects will be fixed by the committee - the project guides will award the marks for the individual students in a project group maintaining the group average'

EE2K 801 : ECONOMICS

Module I (13 hours)

Definition of economics - nature and scope of economic science - nature and scope of managerial economics - basic terms and concepts - goods - utility - value - wealth - factors of production - land - its peculiarities - labour - its peculiarities and division of labour - capital and capital formation - organisation of enterprise - economies of large and 'small scale consumption - wants - its characteristics and classification - law of diminishing marginal utility - relation between economic decision and technical decision - economic efficiency and technical efficiency

Module II (13 hours)

Demand - demand schedule - demand curve - law of demand - elasticity of demand - types of elasticity - factors determining elasticity - measurement - its significance - supply - supply schedule - supply curve law of supply - elasticity of supply - time element in the determination of value - market price and normal price - perfect competition - monopoly monopolistic Competition

Module III (13 hours)

Forms of business - proprietorship - partnership - joint stock company - cooperative organisation - state enterprise - mixed economy - money and banking - nature and functions of money - theory of money - inflation and deflation - banking - kinds - commercial banks central banking functions - control of credit - monetary policy.. credit instrument.

Module IV (13 hours)

International trade - distinction between internal and international trade - theory of international trade - free trade vis protection - balance of trade and balance of payments - exchange control - trade policy of the Government of India - national income - concepts - measurement - difficulties in the measurement its significant - features of underdeveloped economy with special reference to India - taxation - canons of taxation - direct and indirect tax - impact and incidence of the tax - working capital - factors affecting - sources

EE2K 802 : INDUSTRIAL DRIVES

Module I (13 hours)

Fundamentals of electric drives - block diagram of an electric drive - parts of electric drives - dynamics of electric drives - torque equations - speed torque conventions - loads with rotational motion - loads with translational motion - components of load torque - load equalisation - control of electrical drives - drive modeling - closed loop control - current limit control - speed sensing - current sensing - phase locked loop speed control

Module II (13 hours)

. Dc motor drives - constant torque and constant power control - single phase controlled rectifiers with motor loads - fully controlled and half controlled rectifier fed dc drives continuous and discontinuous operation - two quadrant operation - three phase controlled rectifier fed dc drives - dual converter fed control - chopper fed dc drives - closed loop speed control schemes - solar and battery powered drives - braking of dc drives

Module III (13 hours)

Three phase induction motor drives - AC voltage controlled drives - variable frequency control - VSI fed induction motor drive - operation with field weakening - CSI controlled induction motor drives - slip power recovery scheme - rotor frequency control - single phase induction motor drives - PWM drives

Module IV (13 hours)

'Synchronous motor drives synchronous motor variable speed drives- methods of control VSI and CSI fed drives - variable frequency control - self controlled synchronous motor drives - brushless dc motor drives - microprocessor controlled dc and ac drives - block diagrams and flow charts

EE2K 803 : INSTRUMENTATION SYSTEMS

Module I: Transducers (14 hours)

Definition - different types of transducers - criteria for selection - general characteristics dynamic characteristics - calibration - transducers for measurement of displacement - velocity - acceleration - speed - angular rotation - altitude - flow - liquid level - force - torque humidity and moisture - pressure - strain and temperature Hall effect transducers and applications. .

Module II: Signal conditioning, data transmission and telemetry (12 hours)

Signal conditioning - instrumentation amplifiers - differential amplifier - filters - low pass high pass - band, pass and band rejection filters - transducer bridges - null type and deflection bridges - Ac bridges using push- pull transducers - data transmission and telemetry methods of data transmission - general telemetry systems ~ sampling process - principles of time division and frequency division multiplexing - modulation - AM, FM, PM, PAM, FWM, PPM and PCM as applied to telemetry

Module III: Display methods, recorders, experiments and statistical analysis (14 hours)

Display methods and devices - different types of display - display system building blocks - recorders - galvanometric recorders - pen driving system - servo recorders - magnetic recorders - digital recorders - experiments and statistical analysis - performance of experiment - the record of experiment - accuracy and precision - classification of errors - the characteristics of experimental data - description of dispensed data - type of probability distribution - probability error - combination of variances - combined error - guarantee errors

Module IV: Instrumentation systems (12 hours)

Basic measuring systems - analog and digital data acquisition systems - generalized input/output configuration of measuring systems ~ dynamic characteristics - mathematical models - the concept of transfer function (with special reference to measuring systems) - procedure for developing transfer function - response to various types of inputs - classification of instruments based on their order & dynamic and frequency response studies - process control systems for temperature, level and pressure

Reference books

1. Earnest C. Doblin, *Measurement System Application and Design*, McGraw Hill

2. Sawhney A.K., *A Course in Electrical and Electronic Measurements and Instrumentation*, Dhanpat Rai and Sons

3. William David Cooper, *Electronic Instrumentation and Measurement Techniques*, Prentice Hall

4. Ernest O. Doblin, *Measurement System Application and Design*, McGraw Hill International Editions

5. Klaassan K.B., *Electronic Measurement and Instrumentation*, Cambridge University Press

EE2K 804 : POWER SYSTEMS III

Module I (13 hours)

Circuit breakers - principles of operation - different types and their operations - ABCB - oil CB - SFC - vacuum OB - circuit breaker ratings - cause of overvoltages - surges and traveling waves -

voltage waves on loss less line - reflection and attenuation - protection against lightning - earth wires - lightning diverters - surge absorbers - arcing ground - neutral earthing - basic concepts of insulation levels and their selection - BIL -coordination of insulation .

Module II (13 hours)

Protective relays - protective zones - requirement of protective relaying - different types of relays and their applications - generalized theory of relays - protection scheme *for* generator - transformers, lines and busbars - static relays - amplitude and phase comparators - block diagrams of static relays - protection scheme *for* generators - transformers, lines and bus bars - microprocessor based protective relaying

Module III (13 hours)

Electric traction: systems of traction - speed time curve- mechanics .of traction - power supply - systems of current-collection - electric heating - advantage of electric heating resistance and induction arc furnaces - construction and field of application ~ electric weld,; ing - high frequency power supply and the principle and application of dielectric heating

Module IV (13 hours)

Energy conservation in electric motors - lighting and electi-ic heating systems - electrical energy auditing - instrumentation and general methodology - power qualify problems - . definitions - harmonics - sources - effects - total harmonic distortion (THD),.- mitigation methods - passive filter design

EE2K 805A : ELECTRICAL SYSTEM DESIGN & ESTIMATION

Module I (13 hours)

Role of national electrical code in the design of electrical installation - electrical symbols and diagrams - design considerations of electrical installations - electric supply systems - protection and protective devices *for* electric installation against overload - short circuit and earth fault - electric services in building - service connections - service mains - reception and distribution of main supply - sub- circuits - neutral and earth wire - earth bus - guideline *for* installation of littings - design and selection of busbars and busbar chambers - design, selection, layout, drawing and location of distribution boards and panel boards - control and switch gears - criteria for selection of HT and LT underground cables

Module II (13 hours)

Design of illumination schemes - various types of light sources - different types of lighting arrangement - energy efficiency in lamps and illumination - design considerations of good lighting schemes - design of lighting schemes *for* various purposes - lighting calculations design of flood lighting and street lighting - electrical aspects and considerations *for* lifts, escalator services and standby generators - design and safety aspects of electrical installations *for* residential buildings, commercial buidings, hospitals, hotels, recreational and assembly buildings and cinema theatre

Module III (13 hours)

Electrical installations of high rise buildings - design - schematic diagram -layout - estimation and testing of rising main - main supply board and distribution boards *for* high rise buildings including air conditioners and lifts with provision *for* standby generators and its protection - lightning protection - electrical system design - estimation and costing of commercial buildings - design considerations of electrical installations in Industries - design, estimating and costing of electrical installations *for* small industries

Module IV (13 hours)

Selection ofEHV and HVpower and distribution transformers and switchgears - case studies - design - layout - schematic diagram - estimation and costing - (a) 16 MVA - 110/11KV outdoor substation having one or two incoming and 8 or less outgoing - (b) IIKV/415V outdoor substations upto 630KVA - (c) II KV/415V indoor substation upto 630KVA - (d)

busbar trunking above 630 KYA - design of earthing system - earthmat design - design of plate and pipe earthing - shielding of electrical system

EE2K 805B : INTERNET TECHNOLOGIES

Module I (12 hours)

Complller networks and the internet- principles of application-layer protocols - HTP - FTP - e-mail- DNS - socket programming with TCP/UDP - web servers - web pages design using HTML and XML

Module II (13 hours)

Multimedia networking - applications - streaming stored audio and video - internet telephony - RTP - scheduling and policing mechanisms - integrated services - RSVP - differenti. ated services - *network management* - the internet network management framework Module III (14 hours)

Network security - E-mail security - privacy'. SIMIME - IP security - overview - architecture - authentication - header and payload - combining security associations - key management web security - SSL and transport layer security - SET - systems security - intruders and viruses - firewalls - design. trusted systems

Module IV (13 hours)

Mobile internet - mobile network layer - mobile IP - dynamic host configuration protocol ad hoc networks - *mobile transport layer* - implications of TCP on mobility - indirect TCP snooping TCP - mobile TCP - transmission - selective retransmission - transaction-oriented TCP - *support for mobility* - file systems - WAP protocols - WML - WML script - wireless telephony applications

EE2K 805C : NEURAL NETWORKS & FUZZY LOGIC

Module I (13 hours)

Introduction to artificial neural networks - biological neurons - Mc Culloch and Pitts modals of neuron types of activation function - network architectures - knowledge representation learning process - error-correction learning - supervised learning - unsupervised learning. single unit mappings and the perceptron - perceptron convergence theorem (with out proof) - method of steepest descent - least mean square algorithms - adalinelmedaline units multilayer perceptrons - derivation of the back-prop~gation algorithm

Module II (13 hours)

Radial basis and recurrent neural networks - RBF network structure - cover;; theorem and the separabilitY of patterns - RBFlearning strategies - K-means and LMS algorithms - comparison of RBF and MLP networks - recurrent networks - Hopfield networks - energy function - spurious states - error performance - simulated annealing - the Boltzman machine Boltzman learning rule - the mean field theory machine - MFT learning algorithm - applications of neural network - the XOR problem - traveling salesman problem - image compression using MLPs - ' character retrieval using Hopfield networks

Module III (13 hours)

Fuzzy logic - fuzzy sets - properties - operations on fuzzy sets - fuzzy r~lations -operations on fuzzy relations - the extension principle - fuzzy measures - membership functions fuzzifi'cation and defuzzification methods - fuzzy controllers - Mamdani and Sugeno types design parameters - choice of membership functions -fuzzification and defuzzification methods - applications

Module IV (13 hours)

Introduction to genetic algorithm and hybrid systems - genetic algorithms - natural evolution - properties - classification - GA features - coding - selection - reproduction - cross over and mutation operators basic GA and structure

Introduction to Hybrid. systems - concept of neuro- fuzzy and neuro-genetic systems

EE2:K. 805D : IMAGE PROCESSING

Module I (20 hours)

Introduction - digital image representation - fundamental steps in image processing - elements of digital image processing systems - *digital image fundamentals* - elements of visual perception - a simple image model- sampling and quantization -basic relationship between

3. William David Cooper, *Electronic Instrumentation and Measurement Techniques*,
Prentice Hall

4. Ernest O. Doblin, *Measurement System Application and Design*, McGraw Hill International Editions

5. Klaassan K.B., *Electronic Measurement and Instrumentation*, Cambridge University Press

EE2K 804 : POWER SYSTEMS III

Module I (13 hours)

Circuit breakers - principles of operation - different types and their operations - ABCB - oil CB - SFC - vacuum OB - circuit breaker ratings - cause of overvoltages - surges and traveling waves - voltage waves on loss less line - reflection and attenuation - protection against lightning - earth wires - lightning diverters - surge absorbers - arcing ground - neutral earthing - basic concepts of insulation levels and their selection - BIL -coordination of insulation .

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Module III (13 hours)

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Module IV (13 hours)

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EE2K 805A : ELECTRICAL SYSTEM DESIGN & ESTIMATION

Module I (13 hours)

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residential buildings, commercial buildings, hospitals, hotels, recreational and assembly buildings and cinema theatre

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Module IV (13 hours)

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EE2K 806(P) : ADVANCED ELECTRICAL ENGINEERING LAB II

(Twelve experiments from the following topics listed will be scheduled for the laboratory depending on the availability of equipment's, components etc.)

1. Study and experiments on PID controller
2. Closed loop voltage regulation of DC generator using amplidyne
3. MATLAB - II experiments using MATLAB tool box
4. Design and testing of an interrupt- driven clock using 8085 processor
5. Design and testing of an interfacing of a DI A converter with 8085 processor to generate a triangular wave
6. Design and testing of an interfacing of a DI A converter with 8085 processor to generate a sinusoidal wave
7. Design and testing of an interfacing of a AID converter with 8085 processor using a programmable peripheral interface to read an analog signal
8. Performance evaluation of a full wave thyristor rectifier with R-L load
9. Performance evaluation of a buck DC-DC converter with load
10. Performance evaluation of a single phase PWM inverter with a fan load
- II. Experiments on PLC based DC Servo motor trainer system
- 12.. Experiments on PLC based AC Servo motor trainer system
13. Study and experiments of a harmonic analyzer
14. PSPICE simulation of full bridge bipolar switching DC-AC converter.
15. Transient stability analysis of the system with the given single line diagram using the given software package. The disturbance is three-phase to ground solid short circuit fault at time $t=0$. The fault is cleared at time $t = 5$ cycles by permanently removing the fault line
16. Power quality studies on the given set up
17. Experiments on sphere-gaps

EE2K 807(P) : PROJECT

The project work started in the seventh semester will continue - the students should complete the project work in this semester and present it before the assessing committee

The assessment committee as constituted in the seventh semester, will assess the various projects, fix the group average marks - the guides will award the marks for the individual students in a project maintaining the group average - each group will submit the copies

of the completed project report signed by the guide to the department" the head of the department will certify the copies and re.turn them to the students - one copy will be kept in the departmental library

EE2K 808(P) : VIVA VOCE

There is only University examination for this - examiners will be appointed by the university for conducting the viva voce - the viva voce exam will be based on the subjects studied for the B.Tech course, mini project, project and seminar reports ofthe student