COMPUTER SYSTEM ORGANIZATION

Objective:
- Is to acquaint budding engineers with the basic principles of organization, operation and performance of modern-day computer systems.
- It covers all aspects of computer technology, from the underlying integrated circuit technology used to construct computer components, to the use of parallel organization concepts in combining those components.

UNIT-I:

UNIT-II:

UNIT – III:

UNIT-IV:
MICRO PROGRAMMED CONTROL: Control memory, Address sequencing, microprogram example, design of control unit Hard wired control. Microprogrammed control

UNIT-V:
THE MEMORY SYSTEM: Basic concepts semiconductor RAM memories. Read-only memories Cache memories performance considerations, Virtual memories secondary storage.

UNIT-VI:

UNIT-VII:
PIPELINE AND VECTOR PROCESSING: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.

UNIT-VIII:
ELECTRICAL MEASUREMENTS

Objective:
Electrical measurements course introduces the basic principles of all measuring instruments. It also deals with the measurement of RLC parameters voltage, current Power factor, power, energy and magnetic measurements.

UNIT-I Measuring Instruments
Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters-electrometer type and attracted disc type – Extension of range of E.S. Voltmeters.

UNIT-II Instrument transformers
CT and PT – Ratio and phase angle errors – design considerations Type of P.F. Meters – dynamometer and moving iron type – 1-ph and 3-ph meters – Frequency meters – resonance type and Weston type – synchroscopes.

UNIT-III Measurement of Power
Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems.

UNIT-IV Measurement of Energy

UNIT – V Potentiometers

A.C. Potentiometers: polar and coordinate types standardization – applications.

UNIT – VI Resistance Measurements
Method of measuring low, medium and high resistance – sensitivity of Wheatstone’s bridge – Carey Foster’s bridge, Kelvin’s double bridge for measuring low resistance, measurement of high resistance – loss of charge method.

UNIT – VII A.C. Bridges

UNIT – VIII Magnetic Measurements:
POWER SYSTEMS-II

Objective:
This course is an extension of Power systems-I course. It deals with basic theory of transmission lines modeling and their performance analysis. Also this course gives emphasis on mechanical design of transmission lines, cables and insulators.

UNIT-I  Transmission Line Parameters
Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems.
Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

UNIT-II  Performance of Short and Medium Length Transmission Lines
Classification of Transmission Lines - Short, medium and long line and their model representations - Nominal-T, Nominal-Pie and A, B, C, D Constants for symmetrical & Asymmetrical Networks, Numerical Problems.
Mathematical Solutions to estimate regulation and efficiency of all types of lines - Numerical Problems.

UNIT-III  Performance of Long Transmission Lines

UNIT – IV  Power System Transients
Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems). Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

UNIT-V  Various Factors Governing the Performance of Transmission line
Skin and Proximity effects - Description and effect on Resistance of Solid Conductors - Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line, Shunt Compensation.
Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

UNIT-VI  Overhead Line Insulators
Types of Insulators, String efficiency and Methods for improvement, Numerical Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding.

UNIT-VII  Sag and Tension Calculations
Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template and its applications.

UNIT-VIII  Underground Cables
Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress in insulation, Numerical Problems.
Capacitance of Single and 3-Core belted cables, Numerical Problems.
Grading of Cables - Capacitance grading, Numerical Problems, Description of Inter-sheath grading.
POWER ELECTRONICS

Objective:
With the advent of semiconductor devices, revolution is taking place in the power transmission distribution and utilization. This course introduces the basic concepts of power semiconductor devices, converters and choppers and their analysis.

UNIT – I  POWER SEMICONDUCTOR DEVICES
Thyristors – Silicon Controlled Rectifiers (SCR’s) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors – Basic theory of operation of SCR – Static characteristics – Turn on and turn off methods - Dynamic characteristics of SCR - Turn on and Turn off times - Salient points

UNIT – II  DEVICES AND COMMUTATION CIRCUITS

UNIT – III SINGLE PHASE HALF CONTROLLED CONVERTERS
Phase control technique – Single phase Line commutated converters – Mid point and Bridge connections – Half controlled converters with Resistive, RL loads and RLE load– Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Free wheeling Diode – Numerical problems

UNIT – IV SINGLE PHASE FULLY CONTROLLED CONVERTERS
Fully controlled converters, Mid point and Bridge connections with Resistive, RL loads and RLE load– Derivation of average load voltage and current – Line commutated inverters - Active and Reactive power inputs to the converters without and with Free wheeling Diode, Effect of source inductance – Derivation of load voltage and current – Numerical problems.

UNIT – V THREE PHASE LINE COMMUTATED CONVERTERS
Three phase converters – Three pulse and six pulse converters – Mid point and bridge connections average load voltage With R and RL loads – Effect of Source inductance– Dual converters (both single phase and three phase) - Waveforms – Numerical Problems.

UNIT – VI AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS
AC voltage controllers – Single phase two SCR’s in anti parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor wave forms – Firing circuits - Numerical problems - Cyclo converters – Single phase mid point cyclo converters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cyclo converter (Principle of operation only) – Waveforms

UNIT – VII CHOPPERS
Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression
Morgan’s chopper – Jones chopper and Oscillation chopper (Principle of operation only) Waveforms — AC Chopper – Problems.

UNIT – VIII INVERTERS
ELECTRICAL MACHINES - III

Objective:
This subject is an extension of previous machines courses. It deals with the detailed analysis of Synchronous generators and motors which are the prime source of electrical power generation and its utilities. Also concerns about the different types of single phase motors which are having significant applications in house hold appliances and control systems.

UNIT – I Construction and Principle of operation

Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitch and winding factors – E.M.F Equation.

UNIT-II Synchronous Generator Characteristics

Harmonics in generated e.m.f. – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram – load characteristics.

UNIT – III Regulation of Synchronous Generator


UNIT – IV Parallel Operation of Synchronous Generator


UNIT – V Synchronous Motors – Principle of Operation

Theory of operation – phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed .

UNIT-VI Power Circles

Excitation and power circles – hunting and its suppression – Methods of starting – synchronous induction motor.

UNIT – VII Single Phase Motors


UNIT – VIII Special Motors

LINEAR SYSTEMS ANALYSIS

UNIT-I STATE VARIABLE ANALYSIS

UNIT–II FOURIER SERIES AND FOURIER TRANSFORM REPRESENTATION
Introduction, Trigonometric form of Fourier series, Exponential form of Fourier series, Wave symmetry, Fourier integrals and transforms, Fourier transform of a periodic function , Properties of Fourier Transform , Parseval's theorem , Fourier transform of some common signals, Fourier transform relationship with Laplace Transform.

UNIT-III APPLICATIONS OF FOURIER SERIES AND FOURIER TRANSFORM REPRESENTATION
Introduction, Effective value and average values of non sinusoidal periodic waves, currents, Power Factor, Effects of harmonics, Application in Circuit Analysis, Circuit Analysis using Fourier Series.

UNIT – IV LAPLACE TRANSFORM APPLICATIONS
Application of Laplace transform Methods of Analysis – Response of RL, RC, RLC Networks to Step, Ramp, and impulse functions, Shifting Theorem – Convolution Integral – Applications

UNIT-V TESTING OF POLYNOMIALS
Elements of realisability-Hurwitz polynomials-positive real functions-Properties-Testing-Sturm’s Test, examples.

UNIT-VI NETWORK SYNSHESIS
Network synthesis:
Synthesis of one port LC networks-Foster and Cauer methods-Synthesis of RL and RC one port networks-Foster and Cauer methods

UNIT-VII SAMPLING
Sampling theorem – Graphical and Analytical proof for Band Limited Signal impulse sampling, natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, introduction to Band Pass sampling, Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Power density spectrum, Relation between auto correlation function and Energy / Power spectral density function.

UNIT-VIII Z-TRANSFORMS
Fundamental difference between continuous and discrete time signals, discrete time complex, exponential and sinusoidal signals, periodicity of discrete time complex exponential, concept of Z-Transform of a discrete sequence. Distinction between Laplace, Fourier and Z-Transforms. Region of convergence in Z-Transforms, constraints on ROC for various classes of signals, Inverse Z-Transform properties of Z-Transforms.
1. O.C. & S.C. Tests on Single phase Transformer
2. Sumpner’s test on a pair of single phase transformers
3. Scott connection of transformers
4. No-load & Blocked rotor tests on three phase Induction motor
5. Regulation of a three--phase alternator by synchronous impedance & m.m.f. methods
7. Equivalent Circuit of a single phase induction motor
8. Determination of Xd and Xq of a salient pole synchronous machine
9. Parallel operation of Single phase Transformers
10. Separation of core losses of a single phase transformer
11. Brake test on three phase Induction Motor
12. Regulation of three-phase alternator by Z.P.F. and A.S.A methods
13. Efficiency of a three-phase alternator
14. Heat run test on a bank of 3 Nos. of single phase Delta connected transformers
16. Performance characteristics of a Schrage motor
CONTROL SYSTEMS AND SIMULATION LAB

1. Time response of Second order system
2. Characteristics of Synchos
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servo motor
5. Transfer function of DC motor
6. Effect of P, PD, PI, PID Controller on a second order systems
7. Lag and lead compensation – Magnitude and phase plot
8. Transfer function of DC generator
9. Temperature controller using PID
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor

Simulation experiments:-

1. PSPICE simulation of Op-Amp based Integrator and Differentiator circuits.
2. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
3. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB
4. State space model for classical transfer function using MATLAB – Verification.