EE- 501 – Signals & Systems

Unit I- Introduction to Signal & Systems: Signals, classification of signals, basic continuous time and discrete time signals, continuous LTI, discrete LTI systems , impulse and step functions, impulse response stability, linearity, stability, time invariance, eigen values and eigen functions, discrete convolution ,properties of discrete and continuous LTI systems ,systems described by difference and differential equations.

Unit II- Fourier Analysis of Continuous Time Signals and Systems: Fourier series, fourier series representation of continuous periodic signal & its properties, fourier transform and its properties, parseval's theorem, frequency response of LTI systems.

Unit III- Fourier Analysis of Discrete Time Signals & Systems: Discrete-time fourier series, discrete-time fourier transform (including DFT) and properties, frequency response of discrete time LTI systems, continuous time fourier transform for periodic and non-periodic signals, properties of CTFT.

Unit IV- Laplace & Z-Transform Transform: Laplace transform and its inverse: definition, existence conditions, region of convergence and properties, application of laplace transform for the analysis of continuous time LTI system, Z-Transform, properties of Z-transform inversion of Z-transform, two dimensional Z- transform, convergence of Z-transform, region of convergence and properties, application of Z-transform for the analysis of discrete time LTI systems, solving eq. using Z transform.

Unit V- State Space Analysis: Concept of state, state space representation discrete time LTI systems , state space representation of continuous time LTI systems ,solutions of state equation for discrete time LTI systems , solutions of state equation for continuous time LTI systems ,FFT.

Sampling: Sampling theorem, ideal & real sampling, reconstruction of signal from its samples, aliasing sampling in frequency domain, sampling of discrete-time signals.

References:

1. Alan V. Oppenheim, Alan S. Willsky and H. Nawab, Signals and Systems, Prentice Hall, 1997
2. Simon Haykin, Communication Systems, 3rd Edition, John Wiley, 1995.
3. Signals & Systems, 2nd Edition, by Alan Oppenheim, Alan Wilsky, S. Nawab. Prentice Hall, 1997.
4. Signals and Systems, by Simon Haykin and Barry Van Veen. Wiley, 1999.

EE-502 Electrical Machine-II

Unit I - **Basics of Synchronous Machine**: Construction, working principal, types of prime movers, excitation system, polyphase distributive winding, coil span and winding factors , integral and fractional slot windings; emf equation, harmonics and their elimination; armature reaction; synchronous reactance and impedance, equivalent circuit of alternator, relation between generated voltage and terminal voltage, voltage regulation of alternators using synchronous impedance, mmf, zpf and A.S.A method.

Unit II - **Synchronous Machine- I**: Salient pole machines, two reaction theory equivalent circuit model and phasor diagram, determination of Xd and Xq by slip test, power angle equation and characteristics, synchronizing of alternator with infinite busbar, parallel operation and load sharing, synchronizing current, synchronizing power and synchronizing torque coefficient, synchroscopes and phase sequence indicator; effect of varying excitation and mechanical torque.

Unit III - **Synchronous machine-II**: Synchronous motor operation, starting and stopping of synchronous motor, pull in & pull out torque, motor under load power and torque, reluctance torque, effect of excitation, effect of armature reaction, power factor adjustment, V curves, inverted V curves, super synchronous and sub synchronous motors, hunting and damper winding, efficiency and losses.

UNIT IV- Short Circuit Ratio: SCR and its significance, short circuit oscillogram, determination of various transient, sub transient, steady reactances and time constants, expression of transient and sub transient reactances w.r.t self and mutual inductances of various winding, short circuit current, equivalent circuit.

Unit V- Special Electrical machines: PM brushless DC motors, switched reluctance motor, linear induction motor, **stepper motors,** their constructional features, principle of operation, applications.

References:

1. P.S. Bimbhra, Generalised Theory of Electrical Machines.
2. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.
3. Electrical Engineering by JB Gupta, SK Kataria & sons, New Delhi
4. Fitzgerald, C.Kingslay, S.D. Umans, Electric machinery ,5th Ed., McGraw Hills, 1992
5. Electrical Machines, Ashfaq Hussain ,2014

List of Experiments :(Extendable)

1. Study of torque step rate characteristic of a stepper motor.
2. Study of Characteristic of switched reluctance motor.
3. To determine regulation of alternator using mmf and zpf methods.
4. To synchronise alternator with infinite bus bar.
5. To plot V and inverted V curves for a synchronous motor.
6. To find Xd and Xq of salient pole synchronous machine by slip test.

EE 503 – Power Electronics

Unit-I Power Electronic Devices: Power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, LASCR, Fast recovery diode, schottey diode, construction, principle , operation & characteristics of SCR, Two transistor analogy, turn on & off of SCR, commutation techniques (Class A,B,C,D,E, & F Commutation), UJT, ramp triggering, SCR rating & protection, snubber circuit, heating, cooling & mounting of SCR, series and parallel operation of SCR, String efficiency.

Unit-II Rectifier: Single phase half wave & full wave uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction), & RLE loads, average load voltage and load current, active and reactive power, effect of free wheeling diode and source inductance, comparison of mid point & bridge rectifier circuits.

Unit-III Inverter: Series and parallel inverter, Voltage source & current source inverter, Single phase and three phase bridge inverter, Self cumulated inverters,, Mc- murray & MC murray bed ford inverters, Voltage control of single phase and three phase bridge inverter, Harmonics & their reduction.

Unit-IV Chopper: Chopper operation, Step up & step down choppers, chopper configuration (A, B, C, D, & E), Steady state analysis, Current & voltage commutation of chopper circuits, Jones & Morgens chopper.

Unit-V AC voltage controllers: AC voltage controllers using SCRs & traics, single phase full wave controller with R and RL load, RMS load voltage, load current and input power factor, three phase AC voltage controller, Dual converter, Switched mode voltage regulator, buck, Boost, & Chuck regulators, Single phase & three phase cyclo convertor.

References:

1. M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson

1. Education, Singapore, 1993.
2. M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.
3. P.C. Sen, Power Electonics, TMH.
4. M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.
5. Chakravarti A., Fundamental of Power Electronics and Drives, Dhanpat Ray & Co.
6. P.S. Bhimbhra, Power Electonics, Khanna Pub.
7. Vedam Subramanyam, Power Electronics New Age International Revised II ed. 2006.

List of Experiments (Extendable):

1. To study V-I characteristics of SCR.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with R load (ii) L load with and without freewheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study single-phase ac voltage regulator with resistive and inductive loads.

6. To study single phase cyclo-converter.
7. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor.
8. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.

EE 504 - Electronics Instrumentation

Unit I - Cathode Ray Oscilloscope: CRO, electrostatic focusing, electrostatic deflection, post deflection acceleration, screen for CRTs, graticule, vertical & horizontal deflection system, time base circuit, oscilloscope probes attenuators, application of CRO, lissajous patterns, dual trace, dual beam, sampling, storage (analog & digital) oscilloscopes.

Unit II - A.C. Bridges: Measurement, sources and detectors, measurement of inductance, capacitance & Q factor, Maxwell's bridge, Maxwell's inductance & capacitance bridge, Hays bridge, Anderson's bridge, Owen's bridge, De-sauty's bridge, Schering bridge, Heaviside Campbell's bridge, Weins bridge, Universal bridge, errors in bridge circuit, Wagner's earthing device, Q meter .

Unit III - Transducers: Classification, characteristic & choice of transducers, resistive, inductive and capacitive transducers, strain gauge, gauge factor, thermistor, thermo couples, LVDT, RVDT, piezo-electric transducers, magneto elastic and magnetostrictive, hall effect transducers, opto-electronic transducers.

Analog & Digital Data Acquisition Systems: Instrumentation systems used, interfacing transducers to electronic control & measuring systems, d/a multiplexing, a/d multiplexing, special encoders.

Unit IV - Signal Generators: Fixed & variable frequency AF oscillators, sine wave generators, AF sine and square wave generator, function generator, square & pulse generator, random noise generator, sweep generator, TV sweep generator, sweep- marker generator, video pattern generator vectroscope, beat frequency oscillator, frequency selective wave analyzer, heterodyne wave analyzer, harmonic distortion analyzer, spectrum analyzer, digital fourier analyzer.

Unit V - Digital Instruments: Advantages of digital instruments over analog instruments, resolution , sensitivity, digital voltmeter - ramp type, dual slope integration type, integrating type, successive approximation VM, digital multimeter, digital frequency meter, electronic counter, digital tachometer, digital ph meter, digital phase meter, digital capacitance meter, LED, LCD, nixies, electro luminescent, incandescent, liquid vapour display, dot-matrix display, analog recorders, X-Y recorders, RS 232C, IEEE 488, GPIB electric interface.

References:

1. Albert. D. Helfrick, W.D. Cooper, Modern Electronic Instrumentation and measurement techniques, PHI.
2. Kalsi H.S., Electronic Instrumentation, TMH.
3. A.K. Sawhney, Electrical and Electronic measurements and Instrumentation, Dhanpat Rai and Co.
4. E.W. Golding, Electrical Measurement and Measuring Instruments Sir Isaac Pitman and Sons, Ltd. London 1940
5. C.S. Rangan, G.R. Sarma, V.S.V. Mani, Instrumentation Devices

List of Experiments:-

1. Measurement of inductance of a coil using Anderson Bridge.
2. Measurement of capacitance of a capacitor using Schering Bridge.
3. LVDT and capacitance transducers characteristics and calibration.
4. Resistance strain gauge- Strain Measurement and calibration.
5. Measurement of R, L, C & Q using LCR-Q meter.
6. Study & measurement of frequency using Lissajous patterns.
7. Measurement of pressure using pressure sensor.
8. Study of piezo-electric transducer and measurement of impact using piezo-electric transducer
9. Measurement of displacement using LVDT.
10. Measurement of speed of a motor using photoelectric transducer.
11. Study & measurement using ph meter.
12. Temperature measurement & control using thermo couple & using thermistor.

EE-505 Principles of Management & Managerial Economics

Unit I - Management: Scientific management, principles of management, administration and organization, difference and relationship between organization management and administration, importance of management, characteristics of management.

Unit II – Management Planning: Management functions, meaning of planning, advantages of planning, organizing: organizing defined, process of organizing, principles of organizing, organizational structure, staffing process of management, levels of management, project management.

Unit III - Decision Making: Introduction and definition, types of decisions, techniques of decision making, decision making under risk.

Unit IV - Managerial Economics: Introduction, nature & scope of managerial economics application of economics in managerial decision making, micro and macro-economics, theory of the firm, theory of production function.

Unit V - Productivity: Input-Output analysis, micro-economics applied to plants and industrial undertakings, production and production system, productivity, factors affecting productivity, increasing productivity of resources.

References:

1. Peter Dracker, Harper and Row: The Practice of Management.
2. Koontz: Essentials of Management, PHI Learning.
3. Staner: Management, PHI Learning.
4. Daft: Principles of Management, Cengage Learning.
5. T. N. Chhabra: Principle and Practice of Management, Dhanpat Rai, New Delhi.
6. Hirschey: Managerial Economics, Cengage Learning.
7. T. R. Banga and S.C. Sharma: Industrial Organisation and Engineering Economics, Khanna Publishers
8. O.P. Khanna: Industrial Engineering and Management, Dhanpat Rai.
9. Joel Dean: Managerial Economics, PHI learning.
10. V. L. Mote, Samuel Paul and G.S. Gupta: Managerial Economics Concepts & Cases, TMH, New Delhi.
11. V. L. Mote: Managerial Economics, TMH, New Delhi

EE- 506 Matlab & simulation Lab.

Course Content: Introduction to matlab, study of matlab programming, simulation, modeling, design, development of programs using matlab software in the field related to electronics & instrumentation, control system, power electronics etc,

List of Experiment (Extendable):

1. To generate the pulse with the help of comparator.
2. To generate the pulse with the help of PWM techniques
3. To generate the pulse with the help of sine pulse width modulation
4. To observe the output waveform for the MOSFET.
5. To observe the waveform of single phase full wave rectifier circuit with R load
6. To observe the waveform of single phase half wave thyristor circuit with R load
7. To observe the waveform of single phase full wave thyristor circuit with RL & RLE load
8. To observe the waveform of single phase semi convertor circuit with RL & RLE load
9. To observe the waveform of single phase semi convertor circuit, when one of the thyristor is replaced by diode
10. To observe the output waveform for the IGBT& BJT.