(81)

Price- 05

॥ अंतरी पेटवू ज्ञानज्योत ॥

North Maharashtra University,

Jalgaon

Syllabus for Second Year Engineering Degree Course in

Electronics,
Electronics and Telecommunication,
Industrial Electronics

(w.e.f. July, 1999)

Syllabus for S.E. (Electronics, Electronics and Telecommunication, Industrial Electronics)
(With Effect From July, 1999)

SEMESTER I

Sr. No.	Subject Code	Subject	Teaching Scheme Hours / Week		Examination Scheme				
			Lectures	Practical	Paper duration Hours	Maximum Marks			
						Paper	Termwork	Practical	Oral
1		Electronic Devices and Cricuits I	4	4	3	100	25	25	–
2		Networks and Lines	4	2	3	100	25	25	–
3		Digital Electronics	4	4	3	100	25	25	–
4		Electromagnetic Engineering *	4	–	3	100	25	–	–
5		Components and Devices Technology	4	–	3	100	25	–	–
		Total	20	10	–	500	125	75	–
		Grand Total	30		–	700			

SEMESTER II

Sr. No.	Subject Code	Subject	Teaching Scheme Hours / Week		Examination Scheme				
			Lectures	Practical	Paper duration Hours	Maximum Marks			
						Paper	Termwork	Practical	Oral
1		Electronic Devices and Cricuits II	4	4	3	100	25	25	–
2		Electrical Machines **	4	2	3	100	25	–	–
3		Electronic Instrumentation	4	2	3	100	25	25	–
4		Principles of Communication Systems	4	2	3	100	25	25	–
5		Engineering Mathematics III *	4	–	3	100	25	–	–
		Total	20	10	–	500	125	75	–
		Grand Total	30		–	700			

Total Marks of Term I + II = 1400

* Common Paper with S. E. (Computer, Instrumentation, Electrical)

** Common Paper with S.E. (Computer, Instrumentation)

Semester-I, Paper-I

Electronic Devices and Circuits I

Teaching scheme:
Lectures:4 Hrs/week
Practicals: 4 Hrs/week

Examination scheme.
Theory paper:100 marks
(3 Hrs. duration)
Termwork:25 marks
Practical:25 marks

Unit 1

Semiconductors : Concept of mobility and conductivity. Mass-action law.Charge densities in a semiconductor. Electrical properties of Ge and Si.Conduction by drift and diffusion. Equation of total current density.Hall effect and Hall coefficient. (3 Hrs.)

Junction-diode characteristics : Temperature dependance of V-I characteristic. Diode resistance, static and dynamic. Piecewise linear diode characteristic.Transition capacitance and diffusion capacitance. (4 Hrs.)

Rectifiers : Half wave, full wave and bridge rectifiers, ripple factor and regulation calculations. Capacitor filters for hal-fwave and full-wave rectifiers, ripple factor calculations (2 Hrs.)

Diode clippers and clamper circuit. (1Hr.)

Unit 2

Transistor characteristics : Transistor current components ; active, cut-off and saturation regions; Early effect; large-signal current gains 'alpha' and 'beta'. Typical transistor junction voltages. Transistor maximum ratings. (4 Hrs.)

Transistor biasing and thermal stabilization : Operating point, bias stability, thermal instability. Self bias circuit analysis, stability factors, bias compensation using diode, thermistor. Thermal runaway, condition for thermal stability. (6 Hrs.)

Unit 3

Transistor at low frequencies : h-parameters of two - port active circuit. Transistor hybrid model. Analysis of a transistor amplifier circuit using h-parameters. Comparison of transistor amplifier configurations. Miller's theorem. Cascading transistor amplifiers, CE-CC, CC-CE and CE-CE. High input resistance transistor circuits, Darlington circuit, Biasing problem. Bootstrapped Darlington circuit. (10 Hrs.)

Unit 4

Field effect transistor : JFET operation and characteristics, pinch-off voltage. FET small signal equivalent circuit. MOSFET , enhancement and depletion types, operation and characteristics. Low frequency common-source and common-drain amplifiers. Biasing FET and MOSFET. CS and CD amplifiers at high frequencies. (6 Hrs.)

Transistor at high frequencies : Hybrid-PI common emitter transistor model, CE short-circuit current gain, parameter f_T Current gain with resistive load, the upper 3 db frequency f_H. Single stage CE transistor amplifier response , gain bandwidth product. (4 Hrs.)

Unit 5

Feedback amplifiers : Classification of amplifiers, voltage , current, transconductance and transresistance amplifiers. The feedback concept, advantages of negative feedback, transfer gain with feedback. General characteristics of negative feedback amplifiers, voltage-series, current-series, voltage-shunt and current-shunt. Analysis of above types of amplifiers. (5 Hrs.)

Oscillators : Barkhausen criterion, phase-shift oscillator, resonant circuit oscillators. General form of oscillator circuit, Colpitts and Hartley oscillators. Wien bridge oscillator. Clapp and Crystal oscillator. (5 Hrs.)

References

1. Integrated Electronics, Millman and Halkias, Tata McGraw-Hill.
2. Microelectronics, 2nd edition, Millman and Grabel, McGraw-Hill International.
3. Electronic Devices and Circuits, Salivahanan, Kumar and Vallavaraj, Tata McGraw-Hill.
4. Electronic Devices and Circuits, Allen Mottershead, Prentice-Hall of India.
5. Electronic Principles, 5th edition, Malvino, Tata McGraw-Hill.

List of Experiments :

Group A

1. For a half-wave rectifier with capacitor filter, find line regulation, load regulation and ripple factor.
2. For a full-wave bridge rectifier with capacitor filter, find line regulation, load regulation and ripple factor.
3. Diode clipper circuits.
4. Diode clamper circuits.
5. Determine input and output impedances and voltage gain of a CE transistor stage followed by a CC stage

6. Measurement of input, output impedances and voltage gain of a Darlington circuit (a)without bootstrapping, (b)with bootstrapping.
7. Plot static characteristics of a CS-FET. Determine amplification factor, transconductance and dynamic resist ance parameters.
8. For voltage-series negative feedback amplifier find voltage gain, input and output impedances (a)without, (b)with feedback.

Group B

9. For the amplifier in Exp.8, find bandwidth (a)without, (b)with feedback.
10. For current-series negative feedback amplifier, find voltage gain, input and output impedances (a)without, (b)with feedback.
11. For the amplifier in Exp.10, find bandwidth (a)wihout, (b)with feedback.
12. For a phase-shift RC oscillator, measure the output wave and find the frequency and peak to peak amplitude. Compare with the designed values.
13. For Colpitts and Hartley oscillators, measure output voltages and frequencies of oscillation. Compare with de signed values.
14. For Wien bridge oscillator, measure output voltage and frequency of oscillation. Compare with designed values.
15. For the Crystal oscillator, measure output voltage and frequency. Compare with the designed values.
16. Plot the frequency response of CS-FET amplifier. Find midband voltage gain and bandwidth.

The termwork should include a minimum of twelve experiments, six each from groups A and B. The termwork marks will be based on performance in theory and practicals, having a weightage of 40% and 60% respectively.

Semester-I, Paper-II
Networks and Lines

Teaching scheme:
Lectures : 4 Hrs/week
Practicals : 2 Hrs/week

Examination scheme :
Theory paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks
Practical : 25 marks

Unit 1

Network transformations : Network definitions, lumped, distributed, passive and active networks. Mesh and node circuit analysis. Principle of duality. Reduction of a complicated network, T and π equivalents, conversions between T and π sections. Bridged T and lattice networks, equivalent T representations. Superposition and reciprocacity. Thevenin and Norton equivalents. Driving point impedance; transfer impedance. Parallel-T network. Wien bridge. (10 Hrs.)

Unit 2

Resonance : Q factor, series and parallel resonant circuits, resonant frequency, Q and bandwidth of the circuit.
Impedance transformation and coupled circuits : Transformation of impedance with tapped resonant circuits. Reactance L sections for impedance transformation. Image impedance; reactance matching. Reactance T networks for impedance transformation.
Coupled circuits : Mutual inductance, coefficient of coupling. Iron core transformers; the ideal transformer. Singly tuned air-core transformer. Doubly-tuned air-core transfer. undercoupling, overcoupling. (10 Hrs.)

Unit 3

Filters :neper, decibel. Characteristic impedance of symmetrical networks, propogation constant. Constant-k low-pass filter. Constant-k high-pass filter. m-derived T section low-pass and high-pass filters. m-derived π section, low-pass and high-pass filters. Termination with m-derived half sections. Band-pass, band elimination filters. (10 Hrs.)

Unit 4

Attenuators : Symmetrical T & π attenuators, asymmetrical T attenuator, L-type attenuator, asymmetrical π attenuator, Lattice attenuator, Bridged T attenuator, Balanced attenuator, variable attenuator, Ladder attenuator. (10Hrs.)

Unit 5

Transmission line : A line of cascaded T sections, characteristic impedance, propogation constant. Transmission line - general solution. Physical significance of equations, infinite line. Wavelength and velocity of propogation. Waveform distortions. The line without distortion. Reflection on a line not terminated in Zo, Reflection coefficient, open and short circuited line, line calculation, standing wave ratio. (10Hrs.)

References :

1. Network, Lines and Fields, second edition, John D. Ryder, Prentice- Hall of India
2. Networks, Filters and Transmission Lines, P. K. Jain, G. Kaur, Tata Mcgraw-Hill.

List of experiments :

Group A

1 (a) Conversion of T network to PI network.
(b) Conversion of PI network to T network.
2. Conversion of Bridged-T network to T network.
3. Conversion of lattice network to T network.
4. To find Thevenin equivalent of a given circuit.
5. To find Norton equivalent of a given circuit.
6 (a) To find Q and bandwidth of a series resonant circuit.
(b) To find Q and bandwidth of a parallel resonant circuit.

Group B

7 (a) For a constant-k low-pass filter, plot the frequency response. Determine the cut-off frequency and compare with the designed value.
(b) For a m-derived low-pass filter, plot the frequency response. Determine the cut-off frequency and compare with the designed value.
8. For a m-derived band-pass filter, plot the frequency response. Determine the cut-off frequencies and compare with the designed values.
9. Design a T attenuator to introduce an attenuation of 30 db when connected between a source and load, each having an impedance of 600 ohms. Determine the values of series and shunt arms of the attenuator. Verify th design.
10. Determine the elements of a bridged T attenuator to provide an attenuation of 40 db and operated between two 600 ohms impedances. Verify the design.
11. Measurement of primary constants of a transmission line R,L,C.
G and evaluation of Zo.
12. Measurement of VSWR and effect of terminating impedance on VSWR for a transmission line and evaluation of reflection coefficient and Zo.

The termwork should include a minimum of eight experiments, four each from groups A and B. The termwork marks will be based on performance in theory and practicals, having a weightage of 40% and 60% respectively.

Semester-I, Paper-III

Digital Electronics

Teaching Scheme :
Lectures: 4 Hrs./week
Practical : 4 Hrs/week

Examination Scheme .
Theory paper : 100 marks
(3 Hrs. duration)
Term work : 25 marks.
Practical : 25 marks.

Unit 1

Transistor and FET as a switch, switching times, Digital signals, +ve and -ve logics. Boolean algebra, simplication of Boolean expressions. Signed-binary numbers, Ex-OR operation, Excess-3 code, Gray code, parity bit, ASCII code, Hamming code. (10 Hrs.)

Unit 2

Minimization of logic functions using Karnaugh map : functions specified in sum-of-products and product-of-sums forms, minterms and maxterms, don't care conditions, multiple outputs. Code conversion. BCD to 7-segment decoder. (10 Hrs.)

Unit 3

Logic families : TTL NAND gate, specifications, noise immunity, open collector TTL, tri-state TTL, Other logic families, ECL, MOS, CMOS. Arithmetic circuits, half and full adders, half and full substractors, binary parallel adder, 7483, BCD adder, Excess-3 adder, digital comparator. (10 Hrs.)

Unit 4

Multiplexer, demultiplexer, decoders, ALU, carry look ahead, applications (10Hrs.)

Unit 5

Sequential logic circiuts : S-R, clocked SR and JK flip flops, race around condition, master-slave JK flip flop, D flip flop, T flip flop. Asynchronous and synchronous counters, binary,decade and mod-N counter. Shift registers, classification, shift left and shift right, ring counter. Clocked sequential circuit design, state table, state diagram, state reduction. (10Hrs.)

References :

1. Modern Digital Electronics, second edition, R.P. Jain, Tata McGraw-Hill.
2. Digital Electronics : Circiuts and Systems, V.K.Puri, Tata McGraw-Hill.
3. Switching Theory and Logic Design, Hill and Peterson, John Wiley and Sons.
4. Digital Logic and Computer Design, M.Morris Mano, Prentice - Hall of India.

List of Experiments :

Group A

1. Implementation of given Boolean functions using NAND gates.
2. Implementation of given Boolean functions using NOR gates.
3. To implement BCD to Excess-3 code using NAND gates.
4. Implementation of 4-bit binary to Gray code using Ex-OR gates.
5. To demonstrate BCD to 7 segment decoder.
6. To demonstrate 4-bit binary adder using IC.
7. To demonstrate 2-bit comparator using IC.
8. To demonstrate BCD adder using IC.

Group B

9. Verification of Multiplexer and Demultiplexer using ICs.
10. To implement a given logical expression using MUX ICs.
11. To implement a given logical expression using DEMUX ICs.
12. Verification of S-R, J-K, D, and T flip-flops using ICs.
13. To form a four-bit ripple counter using JK flip-flops.
14. To design and implement a mod-5 synchronous counter using JK flip-flops.
15. Implementation of decade up/down counter using IC.
16. ALU - Implementation using IC 74181.

The termwork should include a minimum of twelve experiments ,six each from groups A and B of the above list. The termwork marks will be based on performance in theory and practicals, having a weightage of 40% and 60% respectively.

Semester-I, Paper-IV

Electromagnetic Engineering

(Common with Computer, Instrumentation, Electrical Engineering)

Teaching Scheme :
Lectures : 4 Hrs./week

Examination Scheme :
Theory Paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks.

Unit 1

Electrostatics : Coulomb's law, electric field intensity, field due to continuous volume charge distribution, line charge, sheet of charge. Electric flux density, Gauss' law, application, divergence theorem. Energy and potential; potential gradient. The dipole, its electric field, dipole moment. Energy density in electrostatic field. (10 Hrs.)

Unit 2

Conductors, dielectrics and capacitance : Current and current density, continuity of current, conductor properties and boundary conditions. Nature of dielectric materials, boundary conditions for perfect dielectric materials. Capacitance of parallel plates, energy stored, capacitance of coaxial cable, two-wire line.
Poisson's and Laplace's equations. (10 Hrs.)

Unit 3

Magnetostatics : Biot-Savart law, application to infinitely long current carrying conductor, Ampere's circuital law, application to coaxial cable. Curl operator. Magnetic flux and flux density. Scalar and Vector magnetic potentials. Lorentz force equation. Magnetization and permeability. Magnetic circuit. Energy stored in magnetic field. (10 Hrs.)

Unit 4

Time-varying fields : Faraday's law, Maxwell's equations, Maxwell's equations in integral form, boundary conditions. (4 Hrs)

Uniform plane wave : Wave motion in free space, in perfect dielectrics, In lossy dielectrics, Poynting vector and power density. Propogation in good conductors, skin effect. Reflection of uniform plane waves. Standing wave ratio.(6 Hrs.)

Unit 5

Radiation and Antennas : Radiated power, radiation resistance for short dipole, short monopole, halfwave dipole and quarter wave monopole antennas. Radiation pattern and directivity. Reciprocacity between transmitting and receiving antennas. Folded dipole and yagi antenna. (6 Hrs.)

Antenna arrays : General pattern of two isotropic radiators, broadside and end fire arrays. Binomial and Tchebyshe ff arrays. Principle of pattern multiplication. (4 Hrs.)

References :

1. Engineering Electromagnetics, 5th edition, W. Hayt, Tata McGraw-Hill.
2. Electromagnetics, 4th adition, J. D. Kraus, McGraw-Hill International.
3. Electromagnetic Waves and Radiating Systems, second edition, Jordan and Balmain, Prentice-Hall of India.
4. Antennas, second edition, J.D. Kraus, McGraw-Hill International.
5. Basic Electromagnetics with Applications, Narayana Rao, Prentice-Hall of India.

Semester-I, Paper-V

Components and Devices Technology..

Teaching Scheme :
Lectures : 4 Hrs./week

Examination Scheme :
Theory paper : 100 marks
(3 Hrs. duration)
Term work - 25 marks.

Unit 1

Materials . Electrical conducting materials, Copper, Aluminium, Tungsten, Carbon and Graphite, Nickel, Lead, Tin, Alloys, properties and applications; Insulating materials, Mica, Porcelain, Marble and slate, Polythene, Backelite, polyvinyl chloride, Asbestos, Rubber, Cotton and Silk, Glass, Paper and Boards, wood, Enamel covering, Transformer oil; properties and applications; semiconductor materials, Silicon and Germanium, Silicon-germanium mixed crystals, silicon carbide, Intermetallic compounds, properties and applications; Magnetic materials, Iron and silicon-iron alloys,. Nickel-iron alloys, Carbon-steel, Tungsten steel, Ferrites, properties and applications; Superconducting materials (10 Hrs.)

Unit 2

Passive Components : Resistors, fixed type, carbon composition, carbon film, metal film, construction and characteristics; variable resistors, carbon potentiometer, wire wound potentiometer, construction and characteristics; tolerances of various resistors. Capacitors, fixed type, Electrolytic, Aluminium type, Tantalum type; ceramic capacitors, polystyrene, polyester capacitors, Mica capacitors and paper capacitors, variable capacitors, construction and properties of each type. Inductors, fixed type, air core, iron core, ferrite core inductors; Variable inductors, construction and characteristics. (10 Hrs.)

Unit 3

Discrete devices : Fabrication of discrete and monolithic devices, diodes, transistors, FET and MOSFET; Alloyed junction, diffused junction and epitaxial techniques (10 Hrs.)

Unit 4

Integrated circuits : Monolithic Integrated circuits, chip and components size, photolithographic masking, fabrication of IC resistors, capacitors, diodes and transistors; fabrication of epitaxial-diffused integrated circuits. Thermocompression bonding of leads and packaging of ICs. (10 Hrs.)

Unit 5

Printed circuit boards : Base and conducting materials, artwork, photographic etching techniques, mass soldering techniques, mounting of components, Final protection. Multilayered, flexible PCBs. (10 Hrs)

References :

1. An Introduction to Electrical Engineering Materials, C S. Indulkar, S. Thiruvengadam, 3rd edition, S. Chand and Company.
2. Electronic Devices and Circuits, Salivahanan, Suresh kumar, Valiavaraj, Tata McGraw-Hill.

3. Electronic Engineering Materials and Devices, Allison, Tata Mc Graw-Hill.
4. Printed Circuit Boards - Design and Fabrication, W.Bosshart, Tata Mc Graw-Hill.

Semester-II, Paper-I
Electronic Devices and Circuits II

Teaching Scheme :
Lectures : 4 Hrs./week
Practicals : 4 Hrs/week

Examination Scheme :
Theory paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks
Practical : 25 marks

Unit 1

Multistage amplifiers : Classification of amplifiers, distortion in amplifiers, frequency response of an amplifier. Step response of an amplifier, square-wave testing. Bandpass of cascaded stages, RC-coupled amplifier, low frequency response. High frequency response of two cascaded CE transistor stages. Cascode amplifier. (7 Hrs.)
Differential amplifier : Common-mode rejection ratio, emitter-coupled differential amplifier, with constant current source. (3 Hrs.)

Unit 2

Tuned RF voltage amplifiers : Single tuned amplifier, double tuned amplifier, coefficient of coupling, frequency response, stagger tuned amplifier. (5 Hrs.)
Multivibrators : Astable, monostable and bistable multivibrators using transistors. (3 Hrs.)
Schmitt trigger, voltage-time base circuit. (2 Hrs.)

Unit 3

Large-single amplifiers : Class A audio frequency power amplifier, distortion, efficiency and power dissipation. Performance calculations for class A, class B, AB push-pull operation and complementary symmetry class AB operation. (10 Hrs)

Unit 4

Regulated power supplies : Stabilization, series voltage regulator, short-circuit overload protection circuit,IC voltage regulator. (6 Hrs.)
Switched mode power supply, uninterrupted power supply, block diagrams and working. (2 Hrs.)
Voltage multipliers,doubler, tripler and quadrupler. (2 Hrs.)

Unit 5

Optoelectronic devices : Photoresistor, phototransistor, alphanumeric displays, 7 segment and dot matrix displays. Optocoupler and fiber optics. (3 Hrs.)
SCR, Diac, Triac, firing circuits for power control. Light dimmer circuit using Triac. (4 Hrs.)
Noise : Thermal noise, shot noise, noise figure, measurement of noise figure. Transistor noise, FET noise. (3 Hrs.)

References :

1. Integrated Electronics, Millman and Halkias, Tata McGraw -Hill.
2. Microelectronics, 2nd edition, Millman and Grabel , McGraw-Hill International.
3. Electronic Devices and Circuits, Salivahanan , Kumar, Vallavaraj, Tata McGraw-Hill.
4. Electronic Circuits, Schilling and Belove, 3rd edition, McGraw-Hill International.
5. Electronic Fundamentals and Applications, 5th edition, John D. Ryder, Prentice-Hall of India.

List of Experiments

Group A

1. Square wave testing of an amplifier. Find low and high cut-off frequencies.
2. For two cascaded CE transistor stages find voltage gain and bandwidth.
3. For an emitter-coupled differential amplifier, find CMRR using emitter resistor.
4. In Exp. 3 emitter resistance is replaced by constant current source, find CMRR.
5. Plot the frequency response of a single tuned RF voltage amplifier.
6. Plot the frequency response of a double tuned RF voltage amplifier.
7. Measure the output wave of an astable multivibrator. Compare with designed values.
8. Measure the response of monostable multivibrator and compare with designed values.

Group B

9. Measure the response of Schmitt trigger circuit for a sine wave input. Compare with designed values.
10. Observe the response of a voltage time-base circuit. Compare with designed values.

11. Observe the output of a push-pull class B amplifier. Compare the output when it is driven in class AB operation.
12. Find line and load regulation of a series regulator. Plot the output voltage when the regulator is overloaded.
13. Find the line and load regulation of an IC voltage regulator.
14. Study the firing of an SCR for half-wave operation.
15. Study the firing of two SCRs for full-wave operation.
16. Study the Triac/Diac light dimmer circuit.

The termwork should include a minimum of twelve experiments, six each from groups A and B of the above list. The termwork marks will be based on performance in theory and practicals, having a weightage of 40% and 60%, respectively.

Semester-II, Paper-II

Electrical Machines

(Common with Computer, Instrumentation Engineering)

Teaching scheme :
Lectures : 4 Hrs/week
Practicals : 2 Hrs/week

Examination scheme:
Theory paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks

Unit 1

Three phase circuits : Three phase supplies, phase sequence, connection of three phase windings, star and delta connections. Line and phase voltages and currents in star, delta connections. Power in three phase circuits with balanced load for star and delta connections. Measurement of power by two wattmeter method. Calculation of active and reactive powers. (5 Hrs.)

Magnetic circuits : Concept of mmf, magnetic flux, flux density, field strength, reluctance, permeability, their units and relationships. Series & parallel magnetic circuits. Comparison of electric and magnetic circuits. Hysteresis loss and eddy current loss. (5 Hrs.)

Unit 2

D.C. machines : Construction, types (shunt, series and compound), generator action, emf equation; motor action, significance of back emf, torque and speed equations; torque-armature current, speed-armature current and torque-speed characteristics of different types of motors, different methods of speed control; starter; applications. (10 Hrs.)

Unit 3

Transformers : Single phase transformer, construction, emf equation of transformer, voltage and current transformation ratios, transformer on no load, leakage reactance, transformer on load, phasor diagram, equivalent circuit, regulation, efficiency of transformer, open-circuit and short-circuit tests. Three phase transformers, star/star, delta/delta, star/delta, delta/star connections, Vee and Scott connections, Autotransformer, C.T. and P.T. (10 Hrs.)

Unit 4

Synchronous machines : Alternators, principle of operation, constructional features, synchronous speed, emf equation, winding factors, regulation by synchronous impedance method; Synchronous motors, principle of operation, rotating magnetic field, on no load, on load phasor diagrams, Vee curves, hunting, methods of starting. (10 Hrs.)

Unit 5

Induction motors : Three phase motors, principle of operation, slip, torque equation, torque-slip characteristic, relation between slip and rotor copper loss, equivalent circuit, different types of starters; application. Single phase induction motors, principles of working, types; applications. (7 Hrs.)

Special purpose machines : Principle, working and applications of stepper motor, servomotors and universal motors. (3 Hrs.)

References :

1. Electrical Technology, Edward Hughes, 6th edition, ELBS.
2. Basic Electrical Engineering, V.N. Mittle, Tata McGraw-Hill.
3. Electrical Machines, Second edition, Nagrath and Kothari, Tata McGraw-Hill.
4. Electrical Machines and Power Systems, V. Del Toro, Prentice-Hall of India.
5. Electromechanical Energy Conversion with dynamics of machines, R.D. Bagamudre, New Age International.
6. Electrical Machines, second edition, S.K. Bhattacharya, Tata McGraw-Hill.

List of Experiments :

1. Two wattmeter method of power measurement in 3 phase balanced circuit.
2. Speed control of dc shunt motor by armature voltage and flux control methods.

3. Study of dc shunt motor starter.
4. Load test on dc shunt motor.
5. Load test on dc series motor.
6. O.C. and S.C. test of single phase transformer to determine regulation and efficiency.
7. Scott connection to convert 3-phase supply into 2-phase supply.
8. Regulation of alternator by synchronous impedance method.
9. Regulation of alternator by direct loading method.
10. To plot Vee curves and p.f. curve for synchronous motor.
11. Load test on 3-phase induction motor.
12. Study of various single phase motors.

The termwork should include a minimum of eight experiments from the above list. The termwork marks will be based on performance in theory and practicals having a weightage of 40% and 60% of the total marks respectively.

Semester-II, Paper-III

Electronic Instrumentation

Teaching Scheme
Lectures : 4 Hrs./week
Practicals : 2 Hrs./week

Examination Scheme
Theory paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks
Practicals : 25 marks

Unit 1

Measurement and Error : Definitions, Instrument, Accuracy, Precision, sensitivity, resolution, error. Accuracy and precision. Significant figures. Types of errors, gross error, systematic error, random errors. Statistical analysis, arithmatic mean, deviation from mean, average deviation, standard deviation, probable error. Limiting errors.

Units of measurement : Fundamental and derived units, systems of units, CGS, MKSA and SI. English system of units. Conversion of units.

Standards of measurement : Classification of standards, International standards, primary standards, secondary standards, working standards, standards for mass, length and volume, time and frequency standards, electrical standards, absolute ampere, resistance standards, voltage standards, capacitance standards, inductance standards. Temperature and luminous intensity standards. IEEE standards. (10 Hrs.)

Unit 2

Electromechanical indicating instruments : Permanent-magnet moving- coil mechanism (PMMC), D'Arsonval movement, multirange dc ammeter, multirange dc voltmeter, voltmeter sensitivity, loading effect. Voltmeter-ammeter method of measuring resistance. Series type ohmmeter. Shunt-type ohmmeter. Multimeter or VOM. Calibration of dc instruments. AC indicating instruments, electrodynamometer. Rectifier type instruments. Typical multimeter circuits. Electrodynamometers in power measurements, single phase wattmeter, watthourmeter, power -factor meter. (10 Hrs.)

Unit 3

Bridges and their applications : Wheatstone bridge, measurement errors, sensitivity. Kelvin bridge, Guarded Wheatstone bridge, Megohm bridge. AC bridges, conditions for bridge balance; comparison bridges, capacitance comparison bridge, inductance comparison bridge; Maxwell bridge; Hay bridge; Schering bridge; Wien bridge. Wagner ground connection. (10 Hrs.)

Unit 4

Electronic dc and ac voltmeter. Electronic multimeter. Digital voltmeters, ramp type, integrating, continuous-balance and successive approximation type. All-electronic component measurements. Introduction to C.R.O. and signal generator. (10 Hrs.)

Unit 5

Transducers and applications : Strain gauges capacitive transducer, inductive transducer, Linear variable differential transformer (LVDT), Potentiometric transducer, Resistance thermometer, Thermocouples, Thermistors, their characteristicsand applications (10 Hrs.)

References :

1. Electronic Instrumentation and Measurement Techniques, Cooper and Helfrick, 3rd edition, Prentice-Hall of India.

2. Electronic Instrumentation, H.S. Kalsi, Tata McGraw-Hill.

List of Experiments :

Group A

1. (a) Study of single phase wattmeter.
   (b) Study of single phase watthourmeter.
2. Wheatstone bridge.
3. Kelvin bridge.
4. Maxwell bridge.
5. Hay bridge.
6. Schering bridge.

Group B

7. Wien bridge.
8. Study of digital voltmeter.
9. Study of C.R.O.
10. Study of signal generator.
11. Linear variable differential transformer.
12. Application of thermistor for temperature control.

The termwork should include a minimum of eight experiments, four each from groups A and B of the above list. The termwork marks will be based on performance in theory and practicals, having a weightage of 40% and 60% respectively.

Semester-II, Paper-IV

Principles of Communication systems

Teaching scheme :
Lectures : 4 Hrs./week
Practicals . 2 Hrs./week

Examination Scheme:
Theory paper : 100 marks
(3 Hrs. duration)
Termwork : 25 marks
Practical: 25 marks

Unit 1

Introduction to communication systems : Block diagram of communications system, information, transmitter, channel-noise, reciever; Modulation, need for modulation; Bandwidth requirements, frequency spectra of nonsinusoidal waves.
Noise : External noise, atmospheric noise, extraterrestrial noise, industrial noise; Internal noise, thermal noise, shot noise.
Amplitude modulation : theory, frequency spectrum of AM wave, representation of AM, power relation in AM; Generation of AM, block diagram of AM transmitter. (10 Hrs.)

Unit 2

Frequency modulation . Theory of frequency and phase modulation, frequency spectrum of FM wave. Bandwidth requirement. Generation of FM, noise and frequency modulation.
Radio recievers : Tuned radio frequency reciever, Superhytrodyne reciever. AM reciever. FM reception, FM demodulator (10 Hrs.)

Unit 3

Radiation and Propogation of waves : Electromagnetic rediation, Propogation of waves, ground waves, sky-wave propogation, space waves.
Pulse communication : Pulse modulation and demodulation, types, PAM, PWM, PPM, PCM. Effects of noise. Telegraph and Telex. (10 Hrs.)

Unit 4

Digital Communications : Digital technology, Data communications, Multiplexing. Noise in PCM system. (10 Hrs.)

Unit 5

Telephone Switching : Elemental phone system, central switching, a simple(human) exchange, strowger automatic dialing system. Traffic load and service grade. Hierarchy of switching offices. The crossbar switch. Common control. Pushbutton dialing. Switching matrices. Two way call initiation. Mobile telephone communication.The cellular concept. (10 Hrs.)

References :

1. Electronic Communication Systems, third edition, Kennedy, Tata McGraw-Hill.
2. Principles of Communication systems, second edition, Taub and Schilling, Tata McGraw-Hill.
3. Communication systems, Singh and Sapre, Tata McGraw-Hill.
4. Electronic Communications, third edition, Roddy and Coolen, Prentice-Hall of India.

List of Experiments :

Group A

1. AM modulator and demodulator.
2. FM modulator.
3. FM demodulator.
4. Superhetrodyne reciever.
5. FM reciever.
6. PAM modulator and demodulator.

Group B

7. PWM modulator and demodulator.
8. PPM modulator and demodulator.
9. PCM modulator.
10. PCM demodulator.
11. Study of Telex.
12. Study of Intercom-system.

The termwork should include a minimum of eight experiments, 4 each from groups A and B of the above list. The termwork marks will be based on performance in theory and practicals, having a weightage of 40% to 60% respectively.

Semester-II, Paper-V

Engineering Mathematics III

Teaching Scheme
Lectures : 4 Hrs./week

(Common with Computer, Instrumentation, Electrical Engineering)

Examination Scheme
Theory paper : 100 marks.
(3 Hrs duration)
Termwork : 25 marks

Unit 1

Linear differential equations of nth order with constant coefficients, method of variation of parameters. Homogenous linear D.E., Legendre's LDE, Simultaneous LDE, applications of simultaneous differential equations, application to electrical circuit. (10 Hrs.)

Unit 2

(a) Application of partial differential equations :

i. $\frac{\partial v}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$ (one-dimensional heat flow equation)

ii. $\frac{\partial^2 y}{\partial t^2} = a^2 \frac{\partial^2 y}{\partial x^2}$ (wave equation)

iii. Laplace equation or two dimensional heat flow equation

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$ (5 Hrs.)

(b) Vector differentiation :

i) Differentiation of vector function.

ii) Tangential and normal components of linear acceleration, radial and transverse components of velocity and acceleration.

iii) Gradient of a scalar point function, Divergence and Curl of vector point function, irrotational and solenoidal vectors, vector identities. (5 Hrs.)

Unit 3

Vector integration :

i) Line integral, Surface integral, Volume integral.

ii) Green's lemma, Stoke's theorem, Gauss's divergence theorem.

iii) Applications to electromagnetic fields. (8 Hrs.)

Unit 4

(a) Fourier transform, inverse Fourier transform, properties and theorems; Fourier sine and cosine integrals; Fourier transform of standard functions; Applications of Fourier transform in sampling of signals. Discrete Fourier transform and its properties. (6 Hrs.)

(b) Z-transform, definition of Z-transform, properties of Z-transform; Z-transform of standard sequences; Inverse Z-transform; relationship of Z- transform with Fourier transform; application of Z-transform. (6 Hrs.)

Unit 5

Laplace transform, definition of Laplace transform, inverse Laplace transform, properties and theorems; Laplace transform of standard functions, unit step function, ramp function, impulse function; methods of finding inverse transforms; Applications to solutions of LDEs. (10 Hrs)

References :

1. A Text Book of Engineering Mathematics, P.N. Wartikar, J.N. Wartikar, Pune Vidyarthigrih.
2. Higher Engineering Mathematics, B.S. Grewal.
3. Advanced Engineering Mathematics, Wylie.
4. Advanced Engineering Mathematics, Erwin Kreyszing.