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॥ अंतरी पेटवू ज्ञानज्योत ॥

North Maharashtra University,

Jalgaon

Syllabus for Second Year Engineering Degree Course in

ELECTRICAL

(w.e.f. July, 1999)

North Maharashtra University, Jalgaon

Syllabus for S.E. (Electrical)

(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		AC Circuits and Transformers	4	4	3	100	25	25	–
2		Electrical Engineering Materials	4	2	3	100	25	25	–
3		Electromagnetic Engineering *	4	–	3	100	25	–	–
4		Applied Thermodynamics	4	2	3	100	25	25	–
5		Digital Computational Techniques	4	2	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		Electrical Machines I	4	2	3	100	25	25	–
2		Electrical Measurements I	4	4	3	100	25	25	–
3		Applied Electronics I	4	2	3	100	25	25	–
4		Fluid Mechanics and Machinery	4	2	3	100	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. (Electronics, Electronics and Telecommunication, Industrial Electronics, Computer, Instrumentation)

Semester-I, Paper-I

A.C. Circuits and Transformers

Teaching scheme
Lectures: 4 hrs/week
Practical:4 hrs/week

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

Unit1

Polyphase systems: Concepts of polyphase systems, power in balanced and unbalanced three phase circuits. Measurements of power in three phase , three -wire and four-wire systems. Two wattmeter method for balanced and unbalanced three phase, three wire systems. Balanced three phase loads. Modification of two wattmeter method by using a single wattmeter. Use of wattmeter readings for determining power factor of the load and its nature (lagging, unit or leading). Effect of load power factor on wattmeter readings. Measurements of reactive watt-amperes.

Solution of balanced and unbalanced three phase circuits. Star-Delta and Delta-Star conversion of impedances. Millman's theorem and its application for solving unbalanced, star connected circuits. Instantaneous value problems. (10 Hrs)

Unit 2

Single phase transformers : Constructional details; Arrangement of cores and coils in shell type and core type transformers, Materials used for magnetic cores and windings; EMF equation; voltage and current ratios; concept of leakage flux and its effect; resistance, leakage reactance and leakage impedance of transformer windings and their effects on the transformer performance. Exact and approximate equivalent circuits referred to either side. General phasor diagrams on load and on no-load. Various losses in a transformer; their variation with load. Efficiency, maximum efficiency. Transformer ratings. Voltage regulation , its determination by direct loading and from equivalent circuits. Kapp's resistance, leakage reactance and impedance. (10 Hrs.)

Unit 4

Polyphase transformers: Connecting a bank of three identical single phase transformation. Construction of shell-type and core-type three phase transformers. Comparison between a bank of three identical single phase transformers and a single three phase transformer.

Standard connections for three phase transformers. Their voltage phasor diagrams. Phasor groups. Suitability of particular connections for supplying unbalanced loads; floating neutral.

Parallel operation of three phase transformers. Three winding transformers, tertiary winding. Use of tertiary windings in three phase transformers. Moving coil voltage regulation, construction , principle of working and various uses. (10 Hrs.)

Unit 3

Descriptive treatment of non-sinusoidal waveform of the magnetising currents of a transformer with sinusoidal applied voltage, sketching this waveform and that of the sinusoidal flux from the B-H curve (or flux current curve) of the magnetic core. Concepts of harmonics and the presence of third harmonic in the magnetising current of a transformer. Autotransformers and dimmerstat their ratings and use. Comparison between autotransformers and two winding transformers. Connecting two winding transformer for use as an autotransformer ; its voltage, current and KVA ratings as an autotransformer.

Parallel operation of single transformers, conditions to be satisfied; equivalent circuits and phasor diagrams, load sharing under various conditions. (10 Hrs.)

Unit 5

Special transformer connections: 'V' and 'T' connections of two single phase transformers for three phase to three phase transformation; their phasor diagrams , applications. Scott connection for three phase to two phase transformation and vice-versa, voltage ratios of the transformers. Phasor diagram of voltage and currents of the input and output sides for balanced and unbalanced loads. Applications. (4 Hrs.)

Testing of transformers: Concept of polarity of transformer windings, standard practice of marking transformer winding terminals. Polarity test using a.c. supply and voltmeter; polarity test using a battery, tap-key and d.c. galvanometer.

Open circuit and short circuit tests. Methods of carrying out the tests and information obtained from these,Sumpner's test (back to back). I.S. specifications of transformers. Concepts of routine type tests. Testing of transformers as per I.S. specifications. (6 Hrs.)

References:

1. The performance and design of alternating current machines, M.G. Say , Pitman and Sons.
2. Theory of alternating current machinery, second edition, A.S. Langsdorf, Tata McGraw-Hill.
3. Alternating current circuits, Kerchner and Corcoran, Wiley Eastern.
4. Electrical Technology . 6th edition, Edward Hughes.
5. Basic Electrical Engineering, V.N. Mittle, Tata McGraw-Hill.

List of Experiments :

1. Open circuit and short circuit tests on a single phase transformer.
2. Polarity tests on single phase and three phase transformer, (a) using an a.c. supply and voltmeter, (b) using battery, tap-key and d.c. galvanometer.
3. Sumpner's tests on two identical single phase transformers.
4. Parallel operation of two single phase transformers and study of their load sharing under various conditions of voltage ratio and leakage impedances.
5. Study of connections for three phase transformers; line to line voltage ratios and phase groups.
6. V-connection of two single phase transformers on no load and at balanced load.
7. T-connection of two single phase transformers on no load and at balanced load.
8. Scott connection of two single phase transformers on no load and at balanced load.
9. (a) Study of two wattmeter method for balanced and unbalanced three phase load.
   (b) Effect of load power factors on the wattmeter readings in the case of balanced loads.
10. Measurements of reactive volt-amperes in a three phase balanced load.
11. Verification of Millman's theorem.
12. Study the no-load current waveform of single phase transformer on a C.R.O. at various levels of saturation.

The termwork should include a minimum of ten experiments from the above list. The students should be given instructions about the experiments in the practical hours during the first three weeks. The termwork marks will be based on theory and practicals, having a weightage of 40% and 60% respectively.

Semester-I, Paper-II

Electrical Engineering Materials

Teachingscheme:
Lectures : 4 Hrs/week
Practical : 2 Hrs/week

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

Unit 1

Introduction: Classification of electrical engineering materials based on atomic structure. Hydrogen atom, energy levels, bonds and atomic arrangement in solids. A generalised treatment and explanation of the macroscopic properties of materials from microscopic point of view on the basis of quantum mechanics. Significance of quantum numbers and Pauli's exclusion principle. Crystal structure and defects.

Semi-conducting materials : Bonds in Silicon and Germanium, their electical properties. Hall effect, its use in Gaussmeter.

High resistance materials: Nickel-Chromium alloys, Constantan, Kanthal, Tungsten, Molybdenum. (10 Hrs.)

Unit 2

Conducting materials: resistivity of metals, relaxation, collision time and mean free path. Thermal conductivity, Wiedmann-Frenz law, super conductivity, cryotons and other modern applications of super conductivity. Thermal bimetal; thermocouple materials. (10 Hrs.)

Unit 3

Dielectric properties of insulating materials in static field : Static dielectric field, polarization and dielectric constant, quantitative tratment of dielectric constant of polyatomic molecules. Types of polarization. Derivation of expressions for orientational polarization, internal field and Clausius -Mossotti relation. Ferroelectricity. Spontaneous polarization. Piezoelectricity. (10 Hrs.)

Unit 4

Dielectric properties of insulating materials in alternating field: Complex dielectrics constant. Dependance of polarizability on frequency and temperature. Dielectric by circuit equivalant. Break down of insulating materials : principles of electric break down and facturs influencing the breakdown strength. Different types of insulating materials used for electric machines, transformers, power cables , capacitors and electronic equipment. Testing of insulating materials as per I.S. specifications. (10 Hrs.)

Unit 5

Magnetic materials: review of magnetic circuits . Magnetic dipole moment, magnetization, induced dipole moment, classification of magnetic materials, domain structure, spontaneous magnetization and Curie-Wiesse law. Ferromagnetism and ferrites. Electric sheet steel, hot rolled and cold rolled steel, magnetorestrictive materials, permanent magnet materials, properties and applications of amorphous magnetic materials. (10 Hrs.)

References :

1. Electrical Engineering Materials, A.J. Dekker.
2. A course in Electrical Engineering Materials, S.P.Seth. and P.V. Gupta.
3. Electrical Engineering Materials, C.S. Indulkar and S. Thiruvengadam.
4. Electrical Engineering Materials, S.P. Chhalotra and B.K. Bhat
5. Electrical Engineering Materials, T.T.T.I, Chennai, TMH.

List of Experiments :

1. Testing of insulating oil as per IS.
2. Testing of solid insulating materials as per IS.
3. Testing of power capacitors as per IS.
4. Measurements of resistivity of conducting materials.
5. Measurements of resistivity of resistance materials.
6. Study and use of Gaussmeter.
7. Use of spark gap for measurements of high voltage.
8. To study Seebeck and Peltier effects.
9. Study of hysteresis loop of ferromagnetic materials.
10. Study of various insulating materials.

The termwork should include a minimum of eight experiment from 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-III

Electromagnetic Engineering

(Common with Electronics, Electronics and Telecommunication, Industrial Electronics, Computer, Instrumentation 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.

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.

(4 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 Tchebysheff arrays. Principle of pattern multiplication.

(6 Hrs.)

References :

1 Engineering Electromagnetics, 5th edition, W. Hayt, Tata McGraw-Hill

(4 Hrs.)

2. Electromagnetics, 4th edition, 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-IV
Applied Thermodynamics

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

Examination scheme:
Theory : 100 marks
Duration : 3 Hours
Practical : 25 marks

Unit 1

Steam generators, classifications, constructional features of process and power boilers. Boiler mountings and accessories. Equivalent evaporation, boiler efficiency, energy balance. Rankine cycle, work power output, steam consumption, Rankine efficiency. Method to improve Rankine efficiency. Steam turbine, classification, construction and necessity of compounding of steam turbine. (10 Hrs)

Unit 2

Internal combustion engine : Classification, Otto and diesel cycles, construction and working of 2 stroke and 4 stroke engines. Calculations of IP, BP, FP, BSFC, MEP and efficiencies. Heat balance sheet. Engine trial and performance. Study of fuel feeding, ignition, starting, governing, cooling, lubrication, exhaust and power take off. (10 Hrs)

Unit 3

Air compressor : Uses of compressed air, classification, construction and working of Air compressor, power input, concept of clearance volume, swept volume, singlestage and multistage compression, volumetric and isothermal efficiencies and factors affecting these efficiencies. Necessity of cooling of compressor and compressed air, FAD, air motors, it's use, construction and working. (10 Hrs)

Unit 4

Introduction to heat transfer : Various models of heat transfer, fundamental laws of conduction, convection and radiation. Concept of thermal conductivity, heat transfer coefficient and emissivity, concept of black, grey and white body. Use of fins on electrical appliances. (10 Hrs)

Unit 5

Refrigeration and air conditioning : Refrigeration effect and its uses. Vapour compression cycle, calculations of vapour compression refrigeration system, coefficient of performance, TR capacity. Common refrigerants and their desirable properties. Air conditioner and it's requirement. Properties of moist air, psychometric chart and its use. Psychometric processes such as sensible heating and cooling, humidification and dehumidification. Study of central air conditionig plant. Refrigeration controls and industrial air-conditioning. Vapour absorption system. (10 Hrs)

References :

1. Engineering Thermodynamics, P.K.Nag.
2. Thermal Engineering, R.K.Rajput.
3. Heat Transfer, Gupta and Prakash.
4. Internal Combustion Engines, V.Ganeshan.
5. Basic Thermodynamics, T Roy Chowdhary.

List of experiments :

Group A

1. Study of steam power plant.
2. Study of boiler mountings and accessories.
3. Study of fuel feeding system of an I.C. engine.
4. Study of ignition system of an I.C. engine.

Group B

5. Study and trial on petrol engine at one load.
6. Study and trial on reciprocating air compressor.
7. Study and trial on refrigeration system.
8. Study and visit of central air conditioning plant.
9. Determination of thermal conductivity of metal rod.
10. Determination of Stefan Boltzmann Constant.

11. Calculation of fin efficiency in natural and forced convection.
12. Study and trial on diesel engine at one load.

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

Semester-I, Paper-V

Digital Computational Techniques

Teaching Scheme :
Lectures : 4 Hrs/week
Practical : 2 Hrs/week

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

Unit 1

Number systems and errors in digital computations. Transcendental and polynomial equations: Concept of roots of an equation and methods to find the same. Bisection method, Secant method, Newton-Raphson method, Muller method, Chebyshev method. Birge-Vieta and Bairstow methods for polynomial equations. (10 Hrs.)

Unit 2

Linear algebraic simultaneous equations : Cramer's rule , Gauss method, Gauss-Jordan method. Jacobi iteration method, Gauss-Siedel iteration method. Jacobi method, Given's method, Rutishauser method for estimating Eigen values and Eigen vectors. (10

Unit 3

Interpolation : Lagrange and Newton interpolations ; finite difference operators, interpolating polynomials using finite differences. Bivariate interpolation. Least squares approximation. (10 Hrs)

Unit 4

Differentiation and Integration : Numerical differentiation methods based on interpolation, finite differences, undetermined coefficients. Integration using Trapezoidal and Simpson's rule. (10 Hrs)

Unit 5

Ordinary differential equations : Euler's methods, Taylor series method, Runge-Kutta methods. Multistep methods, predictor-corrector methods. (10 Hrs)

References :

1. Numerical Methods for Scientific and Engineering Computation, 3rd edition, Jain and Iyengar, New Age Internatio
2. Numerical Methods for Engineers, S.K.Gupta, New Age International.
3. Numerical Methods for Scientists and Engineers, Anita, Tata McGraw-Hill.
4. Programming with FORTRAN, Venugopal and Vimala, Tata McGraw-Hill.

List of programs (to be written in Fortran or C language)

1. Program to evaluate truncation error in a series.
2. To find roots of a polynomial using any iterative method.
3. Solution of simultaneous linear algebraic equation.
4. Evaluation of interpolating polynomial.
5. Differentiation using numerical differentiation.
6. Integration using numerical integration.
7. Solution of differential equations.

The termwork should include a minimum of six programs from the above list, executed on the computer. The termwork marks will be based on performance in theory and practicals, having a weightage of 40% and 60% respectively.

Note : In theory paper, questions may be askedon numerical methods or the algorithms/ programs used for solving on the computer.

Semester-II, Paper-I

Electrical Machines I

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

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

Unit 1

D.C. machines : Construction of field system; flux distribution and fringing; magnetic leakage; magnetization curve. Construction of armature and its main parts, commutator, brush rockers and brush gears; types of armature windings, types of enclosures. (5 Hrs.)

D. C. generators: Basic principle of working, E.M.F. equation, types,characeristics and applications of different types of D.C. generators; building up of e.m.f. in a d. c. shunt generator and causes of failures, remedies. (5Hrs.)

Unit2

D.C. motors : Basic principle of working, significance of back e.m.f.; torque eqution; types, characteristics and applications of different types of D.C. motors, starting, reversing and armature voltage and field control method of speed control, starters.(7Hrs.)
Armature reaction in d.c. motors and generators; effect on the field from with and without brush lead; effect of saturation; demagnetising and cross- magnetising m.m.f's and their estimation; remedies to overcome armature reaction. (3Hrs.)

Unit 3

Process of commutation, time of commutation; reactance voltage, straight line commutation , with variable current density, under and over commutation; causes of bad commutation and remedies, interpoles, compensating windings. (3Hrs.)
Losses and efficiency of d.c. machines, condition for maximum efficiency and maximum power output; effect of saturation and armature reaction on losses. (2Hrs.)
Testing Of d.c. machines : Insulation resistance tests; brake test; Swinburne's test; regenerative tests on series and shunt motors; separation of various losses, retardation test; heat run and temperature rise tests; commutation tests; armature faults; type of routine tests accorsing to ISI specifications. (5Hrs.)

Unit 4

Polyphase Induction machines : construction ; production of rotating magnectic fields; principle of working; induction motor as a generalized transformer; simplified theory with constant flux; slip, rotor e.m.f, current, power and torquerelations; torque-slip characteristics; conditions for maximum torque, exact and approximate equivalent circuit; circle diagram computations; experimental tests for plotting circle diagram. (10Hrs)

Unit 5

Method of starting slip ring and cage rotor induction motors; various types of starters; high starting torque sequirrel cage motors; double squirrel cage motors, industrial applications of different types of motors; cogging, crawling and noise production in induction motors. (4 Hrs.)
Speed and power factor control of motors : rheostatic speed control; phase advancers; speed adjustment by pole changing ; speed control by change of frequincy; cascading. (3 Hrs.)
Induction voltage regulators ; induction generator.
Tests as per ISI specifications. (3 Hrs.)

References

1. Design and performance of d.c. machines, E.W. Clayton.
2. Design and performance of a.c. machines, M.G. Say.
3. A.C. machines, Langsdorf, TMH.
4. D.C. machines, Langdorf.
5. Electric machinery, P.C.Sen.
6. Electric Machines, second edition, Nagrath and Kothari, TMH

List of Experiments :

Group A

1. Determination of magnetization, external and internal charateristics of d.c. shunt generator.
2. Determination of magnetization,external and internal charateristics of d.c. series generator.
3. Determination of external charactristic of a d.c. compounded generator as (i) differential and (ii) cumulative compound.
4. Speed control of d.c. shunt motor by armature and field control.
5. a) Study of three point and four point starters.

b) Reversal of motor rotation.

8. Load test on d.c. shunt motor.
7. Seperation of no load losses into hysteresis, eddy current, friction and windage losses.

Group B

6. Field's test.
9. Retardation Test.
10. Load test on induction motor.11. Determination of performance of induction motor from circle diagram.
12. Study of induction motor starters.
13. Speed control of slip - ring induction motor using rotor resistance method.

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

Semester-II, Paper-II

Electrical Measurements-I

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

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

Unit 1

International system of units, dimensions of electrical quantities. Absolute measurements of current and resistance. (4 Hrs.)
Magnetic measurements : Fluxmeter , B-H curve of a ring specimen , hysteresis loop, permeameters; Iron loss test at power frequency, effect of voltage, frequency and form factor on iron loss, separation of iron losses. (6Hrs.)

Unit 2

Measurements of resistance : Classification, ohm-meter, ratio-meter, D.C. potentiometer, Kelvin's double bridge, measurements of high resistance, measurement of earth resistance and resistivity, bridge megger and ductor megger, measurement of insulation resistance. (10Hrs.)

Unit 3

Measuring instruments (general theory): Static and dynamic characteristics of an instrument, accuracy ,linearity, reproductivity ,sensitivity, resolution, speed of response.
Galvanometer: Construction, deflection , controlling ,damping, balancing systemes, D'Arsonval, Ballistic and vibration galvanometers. (10 Hr

Unit 4

Ammeter and voltmeters: Construction, principle of operations torque equations and errors of PMMC, moving iron and electrostatic instruments. Extension of ranges using short and multipliers.
Instrument transformers: Theory, expression for ratio and phase angle errors. Design considerations and testing. Precautions in using instruments transformers. (4Hrs.)

Unit 5

Wattmeters and Energymeters: Construction and principle of operation of electrodynamic and conduction type wattmeters. Construction and working of low P.F. wattmeters. Errors and their compensation. Construction and principle of operation and torque equation of induction type energymeter. Error and adjustments. (10 Hrs)

References:

1. Electrical Measurments and Measuring Instruments, E.W.Golding.
2. Fundamentals of Electrical Measurments, C.T. Baldwin.
3. Electronic Instrumentation and Measurements Techniques, 3rd Edition, Cooper and Derflick, Prentice-Hall of India.

List of Experiments:

1. Barlow method of measurements of power using two CT's.
2. Barlow method of measurement of power using P.T.
3. Measurement of power in 3-ph 4-wire curcuit.
4. Calibration of single phase energymeter at different p.f.'s
5. Calibration of three phase two elements energy meter at different p.f.'s.
6. Use of D.C. potentiometer for calibration of ammeter and voltmeter.

7. Kelvin's double bridge.
8. Anderson's bridge
9. Epstein square.
10. Measurements of phase angle error and ratio error of C.T.
11. Measurement of phase angle error and ratio error of P.T.
12. Measurement of earth resistance.

The termwork should include a minimum of ten experiments from the above list. The students should given instructions about the experiments in the practical hours during the first three weeks. The termwork marks will be based on performance in theory and practicals, having a weightage of 40% and 60% respectively

Semester-II, Paper-III
Applied Electronics-I

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

Examination scheme :
Theory paper : 100 marks
Termwork : 25 Marks
Practical : 25 Marks

Unit 1

Transistors : Biasing circuits, comparision, stabilization, High input resistance circuits. Low frequency analysis of amplifier using h-parameters (CE configuration only), frequency response,methods of cascading,effect of cascading. (7 Hrs.)

Field effect transistors , construction, principle of operation , characteristics, different configurations, FET as an amplifier. MOSFETs. (3 Hrs.)

Unit 2

A.F. Power amplifiers : Different classes of operations, different types of A.F. power amplifier circuits. Feedback amplifiers : Necessity of feedback, types of feedback , typical circuits using negative feedback, performance of amplifiers using negative feedback, idendification of different topologies. (10 Hrs.)

Unit 3

Operation amplifiers: op-amp parameters, characeristics. Simple mathematical analysis of op-amp applications such as inverting, non-inverting, summing amplifiers , substractors, integrator, differentiator. Schmitt trigger. Multiplication and division (using log ,antilog and amplifier circuits.) (6 Hrs.)

Introduction to digital circuits. Different logic families, specification and comparison. Applications of logic gates such as single bit comparator, substrator circuits, various flip-flops (S-R, D, J-K). (4 Hrs.)

Unit 4

Special devices : PUT, DIAC, optocouplers optical encoder and decoder circuits.

Power swiching devices: TRIAC, LASCR, power diodes , power MOSFETS, IGBT, construction, operating principles, characteristics, simple applications. (10Hrs.)

Unit 5

Power supplies : Regulated power supplies, discrete shunt and series regulator, IC regulators, protection circuits, introduction to SMPS and UPS (only block schematic and working principle).

CRO : block schematic, working and its applications. (10 Hrs.)

References:

1. Electronic Devices and Circuit Theory, Boylestead and Nashelsky, Prentice -Hall of India.
2. Operational Amplifiers, Ramakant Gaikwad, PHI
3. Digital Principles, Malvino and Leach, TMH.
4. Optoelectronics, Deboo and Burroughs, MH.
5. Power Electronics, C.W. Lander, MH International.
6. Integrated Electronics, Millman and Halkias, TMH.

List of Experiments:

Group A

1. Study of CRO and applications: voltage , current, frequency and phase measurements.
2. Two stage RC-coupled amplifier: to plot the frequency response and to determine the bandwidth and mid-band voltage gain . Compare the same with the designed values.
3. To observe the output voltage of a class B push-pull power amplifier. Compare it when it is operated in class AB

operation.

4. For a current series feedback amplifier, find input and output impedances and voltage gain, (a) without feedback (b) with feedback. Justify the change in results.
5. For the amplifier in Exp. 4., plot the frequency response, (a) without feedback (b) with feedback. Find band width in each case and justify the change in band width.
6. For a series regulator circuit, find load and line regulation. Plot the output voltage when the regulator is overloaded.

Group B

7. To plot the characteristics of (a) phototransistor (b) LDR.
8. Op-amp applications : Differentiator and integrator.
9. BCD subtractor using IC 7483.
10. To verify the truth tables of S-R, D and J-K flip-flops.
11. Application of Triac as full-wave rectifier.
12. Schmitt trigger using op-amp.

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-II, Paper-IV
Fluid Mechanics and Machinery

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

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

Unit 1

Introduction and fluid properties : S.I. units, definition of fluid, definition and scope of fluid mechanics, mass density ,specific weight,specific gravity, viscosity and Newton's law of viscosity and classifications of fluids, vapour pressure and cavitation, surface tension and capillarity, compressibility and elasticity, velocity of sound and mach number.
Fluid statics : Pressure at a point, Pascal's law, liquid pressure on plane and curved surfaces and centre of pressure. (10 Hrs)

Unit 2

Fluid flow kinematics and dynamics : Types of flows - steady and unsteady, uniform and nonuniform, laminar and turbulent, 1,2 and 3 dimensional, rotational and irrotational, streamline and streamtube, pathline, velocity and acceleration and their components. Continuity equation for 1-D, 3-D flows, Euler's and Bernoulli's equation along a streamline and for 3-D flow for both compressible and incompressible fluids, application of Bernoulli's equations
a)Measurement of velocity-pitot tube.
b)Measurement of discharge- venturimeter and orifice meter, circular and sharp-edged orifice, rectangular and triangular notches, corrections for end contractions and velocity of approach. (10

Unit 3

Flow through pipes : Laminar flow, Hagen-Poiseuille equation; turbulent flow, Dracy-Weibach equation, Moody's diagram and it's use, Major and Minor losses. Pipes in series and parallel.
Dimension Analysis : Dimensions of physical quantities, dimensional homogenity, Buckingham pi theorem, important dimensionless numbers. (10 Hrs)

Unit 4

Momentum equation, application of stationary and moving vanes (flat and curved)
Water turbines : Classification, layout of hydraulic power plant. Turbine selection, performance and governing.
a)Impulse turbine : Constructional details of Pelton wheel, work done, power development and efficiency.
b)Reaction turbine : Principle of operation, constructional details of propeller, Kaplan and Francis turbine, draft tube and problems of cavitation, work done, power developed and efficiency. (10 Hrs)

Unit 5

Pumps : Classifications, Positive displacement (gear, vane and piston pumps) and centrifugal pumps, jet pumps. Submersible pumps, construction and working, head developed, discharge and power input required, pump characteristics, pump selection. (10 Hrs)

References :

1. Fluid Mechanics, V.L.Streeter and Wylie, McGraw-Hill.
2. Fluid Mechanics, A.K.Jain, Khanna Publishers.
3. Engineering Fluid Mechanics, K.L.Kumar, Eurasia Publishing House.
4. Engineering Fluid Mechanics, R.J.Gorade and R.J.Mirajgaonkar, Nemchand Bros.
5. Hydraulics and Fluic Mechanics, P.N.Modi and S.M.Seth, Standard book.
6. A text book of Fluid Mechanics and Hydraulic Machines, R.K.Bansal, Laxmi Publications.
7. Fluid Mechanics and Hydraulics with Computer Applications, J.Lal, Metropolitan Book Co.
8. Fluid Mechanics, A.K.Mohanty, Prentice-Hall of India.
9. Hydraulic Machines, J.Lal, Metropoiltan book Co.

List of Experiments

Group A

1. To find viscosity of liquid and it's variation with temperature.
2. Study of pressure measuring devices consisting of pressure gauge and simple and differential manometers.
3. Verification of Bernoulli's theorem.
4. Calibration of venturimeter or orifice meter.
5. Calibration of sharp-edged circular orifice.
6. Study of laminar and turbulent flow by use of Renold'd apparatus.

Group B

7. Study of velocity distribution in pipe for laminar turbulent flow.
8. Study of variation of "f" for laminar and turbulent flow through pipes.
9. Study of minor losses in pipe flow.
10. Study of momentum equation by impact of jet.
11. Study of trial on Francis/Pelton turbine.
12. Study and trial on centrifugal pump.

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-II, Paper-V

Engineering Mathematics III

Teaching Scheme		Examination Scheme
Lectures : 4 Hrs./week	(Common with Electronics, Electronics and Telecommunication, Industrial Electronics, Computer, Instrumentation Engineering)	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 accelera tion.

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; Applicatio 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.