CM-102 COMMUNICATION TECHNIQUES-I

L T P

Pds/week 3 - -

RATIONALE

This course aims at developing reading, writing and communications skills in. the students so as to develop confidence in them in written and oral techniques of communication in English language. This course will also help the students in continuing education needs.

Note: Weightage Of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Prose Text Book

Prose book of about 150 pages well illustrated containing roughly though not necessarily

Biographies of two engineers and Scientists; biographies of two great men (one religious leader and one national leader), two literary short stories, two humorous short stories one short story of the type of scientific fiction; one essay. The text book shall be officially prescribed and <W> also contain a list of administrative and technical terms approximately 150 words).

2. Terminology (10%)

Common administrative and technical terms with their Hindi equivalents from. Prescribed 1ist as given in the text book. Foreign students or those who do not know Hindi may be asked to explain the terms in English.

3. Grammar (20%)

A Brief view of easy form of tenses (past indefinite, past continuous, past perfect, past perfect continuous, present indefinite, present continuous, present perfect present perfect continuous, future indefinite. Conversion of <W> <L> <L>

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4. Comprehension (20%)

A passage of 100-150 words may be set to test the comprehension skill of the student. Simple question to test the understanding of the contents and vocabulary may be set.

5. Essay (20%)

Preferably on scientific topic from the given out lines. The paper setter may be instructed to give a choice of attempting one out of three topics. The question paper shall provide the outlines. The essay will be the of 250 to 300 words examiner may select three topics one from each following fields:

i) Science

ii) Technology and

iii) General

6. Practice of Speaking in English Language by or Organizing
(Not for examination)

- Paper reading contests
- Discussion sessions
- Conduct of seminars on current topics
- Declamation contests

BS- 11 2 APPLI ED MATH EMATICS- I

	L	T	P
Pds/ week	3	1	-

RATIONALE

The courses aim at developing analytical abilities in basics of applied mathematics such as: vector algebra, matrices, elementary numerical analysis, coordinate geometry, differential and integral ca1cu1us and solution of first order differential equations. Besides application of above the elements in engineering, the course of study will also provide continuing education base to them.

NOTE: Weight age of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Vector Algebra (20%)

   1.1 Definition, notation and rectangular resolution of a vector

   1.2 Addition and subtraction of vectors

   1.3 Scalar and vector products of 2 vectors on1y

   1.4 Simple problems related to work, moment and Angular velocity

2. Matrices (20%)

   2.1 Definition and types of matrices

   2.2 Addition and subtraction of matrices, multiplication of matrices

   2.3 Inverse of a 3x3 matrix by adjoint matrix method

   2.4 Solution of linear questions containing upto three unknown only

3. Elementary Numerical analysis: (20%)

   3.1 Newtons forward and <W> differences shift operator

   3.2 Difference table

3.3 Newton - Gregory forward and backward interpolation formulae

3.4 Lagranges interpolation formulae.

4. Coordinate Geometry (40%)

4.1 Point:

Cartesian and polar co-ordinates and their conversion, distance between two points, internal and external division formulae coordinates of centroid and in centre, Area of Triangle, condition of collinearity of points, simple problems on locus.

4.2 Straight Line:

Equation of a straight line in various standard forms, Angle between straight lines, perpendicular distance formula

4.3 Circle

The equation of circle in standard and general form, finding t he equation of circle when

- its centre and radius are given
- any three points on it are given

4.4 Conics:

a) Definition of conics, parabola ellipse and hyperbola and their standard equations

b) Finding the equation of a parabola, when its focus and directrix or focus and vertex are given

c) Finding the equation of an ellipse of hyperbola when focus, directrix , vertex, axis eccentricity and a length of latus rectum

d) Given the standard equation of conic to find its locus, directrix vertex, axis accentricity and <W> length of latus rectum

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BS – 113 APPLIED AHYSICS – 1

L T P
Pds/week 3 - 2/2

RATIONALE

Applied Physics is a foundation course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. The course covers basics like Mechanics. Heart, Waves, Sound, Light, Electrostatics, Electromagnetism and d.c. circuits. While teaching the subject teachers should make maximum use of demonstration to make the subjects interesting to the students.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Units and Dimensions (15%)

Fundamental and derived units in SI System, Dimensions of physical quantities. Principle of homogeneity. Dimensional equations. Applications of dimensional analysis:

a) Checking the correctness of physical equations

b) Derivation of simple physical relations and

c) Conversion of units

Limitations of dimensional analysis

2. Force and Motion (20%)

a) Scalar and vector quantities with Examples.

b) Force and its units (in SI)

c) Resolution of forces into rectangular components (Simple problems)

d) Composition of forces by parallelogram law.

e) Parabolic motion Horizontal projection and projective at an angle time of flight horizontal range and <W> horizontal range. Simple problem.

<L>

g) Concept its friction and its application. Application to banking of roads.

3. Work, Power and Energy (10%)

Work and its units. Work done on bodies moving on horizontal and inclined planes (consider frictional forces also) Concept of power and its units. Calculation of power (simple cases). Concept of kinetic energy and potential energy. Expressions for P.F and K.L. Conservation of energy in the case of freely falling bodies. Principle of conservation of energy.

4. Rotational and Simple Harmonic Motions (10%)

a) Definition of moment of inertia

b) Torque and angular momentum and their inter relation

c) Principles of conservation (angular momentum and it application)

d) Kinetic energy of rolling body

e) S.H.M derivation of displacement velocity acceleration time period and frequency (Motion of cantilever). Free forced and resonant vibrations (No derivation)

5. Temperature and its measurement (10%)

Concept of heat and temperature on the basis of K.F of molecules. Units of heat. Basic principles of measurement of temperature. Thermo couple. Bimetallic and resistance, thermo-meter. Ranges of these thermometer. Criteria for the selection of a thermometer.

6. Expansion of Solids <W>

Coefficient of linear surface and cubical expansions and relations amongst them. Thermal stresses (qualitative only) and their applications

7. Beat Transfer (20%)

Three modes of transfer of heat. Coefficient of thermal conductivity, its determination by <W> method and <W> disc method. Conduction through compound media <W> <W> parallel for two materials only). Heat <W> Characteristics of heat <W>. Prevost's theory of heat exchange of heat traditions. <W><W> <L>

LIST OF EXPERIMENTS

1. To determine the density of a cylinder using vernier calipers and balance.
2. To determine the area of cross section of a wire using screw gauge.
3. To determine the thickness of glass piece using spherometer.
4. Calculation and verification of period of vibrations of a cantilever (use graph).
5. Measurement of K.F gained by a body dropped through a height h.
6. Measurement of coefficient of thermal expansion.

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ES – 120 APPLIED MECHANICS

	L	T	P
Pds/week	3	2	2

RATINALE

The Subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity laws of motion and simple machines which are required to the students for further understanding of other applied subjects. Hence this course.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Introduction (5%)

   Concept of mechanics and applied mechanics. Explanation of mechanics and applied Mechanics, its importance and necessity, giving suitable example on bodies at rest and in motion explanation of branches of this subject, concept of rigid bodies.

2. Laws of Forces (15%)

   Force and its effects, units and measurement of force, characteristics of force vector representation, how's notation.

   Types of forces, action and reaction, tension. Thrust and shear force. Force systems: Coplanar and concurrent and non concurrent forces. Free body diagrams.

   Resultant and component's of forces, concepts of equilibrium: Parallelogram law of forces, equilibrium of two forces super position and transmissibility of forces. Newtons third law triangle of forces, different cases of concurrent coplanar two forces systems extension of parallelogram law and triangle law to many forces acting at one point-polygon law of forces, ,method of resolution into orthogonal components for finding the resultant, graphical methods, special case of three concurrent, coplanar forces, <W> theorem.

3. Moments (15%)

   Concept of moment Varignon theorem statements <W> Principle of moments application of moments to simple mechanism, parallel forces like and unlike parallel calculation of their <W>

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4. Friction (10%)

Concept of friction, laws of friction, limiting friction and coefficient of friction, sliding friction and rolling friction.

5. Centre of Gravity (15%)

Concept of gravity, gravitational force, centroid and centre of gravity, centroid for regular lamina and centre of gravity for regular solids. Position of centre of gravity of compound bodies and centroid of composite area. CG of bodies with portions removed.

6. Moment of Inertia (15%)

Concept of moment of inertia and second moment of area and Radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical sections, rectangle, triangle, circle (without derivations). Second moment of area for L.T. and I sections. Section modulus.

7. Law of Motion (15%)

Concept of momentum, Newton's law of motion, their application, derivation of force equation from second law of motion, numerical problems on second law of motion, piles, lifts, bodies tied with string. Newtons third law of motion numerical problems. Conservation of momentum, impulse and impulsive force (definition only).

8. Simple Machine (10%)

Concept of machine, mechanical advantage, velocity ratio and efficiency of a machine, their relationship, law of machine, simple machines (lever, wheel and axle, pulleys, jacks , <W>, crabs only).

LIST OF PRACTICALS

1. Verification of the laws of polygon of forces.

2. To verify the forces in the different members of <W> crane.

3. To verify the reaction at the supports of a simply supported beam.

4. To find the mechanical advantage velocity <W> efficiency in the case of <W>

5. To find the mechanical advantage, velocity ratio and efficiency in case of screw jack.

6. To find the mechanical advantage, velocity ratio and efficiency in the case of Worm and Worm wheel.

7. To find the mechanical advantage, velocity ratio and efficiency in the case of Winch Crab- single- Graphical representation.

8. To find out the centre of gravity of regular <W>.

9. To find out centre of gravity of a irregular <W>.

10. To determine coefficient of friction between 3 pairs of given surfaces.

11. To determine personal horse power of the experimenter.

CE-131 ELEMENTS OF CIVIL ENGINEERING

(COMMON TO MECHANICAL AND ELECTRICAL ENGINEERING)

	L T P
Pds/week	3 - 2

RATIONALE

This is an appreciation course and is useful to understand regarding various types of engineering materials, their characteristics and usages; elements of building construction and surveying. This knowledge will be quite helpful to diploma engineers in their professional career.

NOTE: Weightage of each topic for external examination is given in the brackets.

DETAILED CONTENTS

1. Civil Engineering Materials (40%)

Properties and uses of bricks, stones, stone aggregate, cement and cement concrete.

Timber

Different types of timber, identification, properties and uses of different types of timbers.

Fire Resistant Materials

Properties and uses anti – vibration and sand proofing materials. Bitumen and asphalt.

2. Elementary Surveying (15%)

Brief idea of chain surveying, compass surveying and leveling, use of theodolite in alignments.

3. Building Constructions (45%)

a) Selection of site for construction of a building. Setting out of a building, various components of a building to be used in : residential building, workshops, factories and power houses. Water supply and sanitation of buildings.

b) Foundations

Elementary idea of foundations, special foundations and foundations used for factories, power houses, Machine formulations: Elimination of Vibrations.

c) General principles of brick masonry. English bonds. Floors and types of flooring with particular reference to industrial floorings.

d) Sloping, trussed and RCC roofs for factories.

LIST OF PRACTICALS

1. To determine initial setting time of cement.
2. To perform slump test.
3. Laying of bricks in different layer using English bond.
4. Ranging and chaining of a survey line.
5. Study of prismatic compass and taking readings
6. Study and use of a level, simple leveling.
7. Study of theodolite and its uses.
8. Identification of timbers.

BS-121 ENGINEERING DRAWING – I

	L	T	P
Pds/ week	-	-	8

RATIONALE

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The course is aimed at in developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings their reading and interpretation. The emphasis while imparting instructions should be to develop conceptual skills in the students.

NOTE:
1) Weightage of each topic for external examination is given in the brackets.
2) First Angle Projection to be followed.
3) Minimum of 12 sheets to be prepared by each student.
4) BIS SP 46-1988 should be followed.

DETAILED CONTENTS

1. Handling, Use and Care of drawing Instruments and materials (5%)

   a) Drawing instruments.

   b) Layout of drawing sheets.

2. Different type of lines and Free hand Sketching (5%)

   a) Different types of lines in Engineering drawing as per ISI specifications.

   b) Practice in free hand sketching of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles and circles.

3. Lettering Technique and Practice (5%)

   a) Instrumental Single stroke lettering of 35mm and 70 mm height in the ratio of 7:4.

   b) Free hand lettering (Alphabet and numerals) – lower case and upper case , single stroke and block letters, vertical and inclined at 75 degree in different standard series of 3.5, 3.5, 5, 7, 10, 14 and 20 mm heights in the ratio of 7 : 4.

4. Dimensioning Technique (5%)

4.1 Necessity of dimensioning, methods and principles dimensioning (mainly theoretical instructions)

4.2 Dimensioning of: Overall sizes. Circles, theade holes, chamfered surfaces, angles, tapered surfaces holes equally spaced on P.C.D., counter sunk holes counter bored holes, cylindrical parts, narrow space and gaps, radii, curves and arches.

5. Scales (5%)

5.1 Scales – their need and importance

5.2 Drawing of plain and diagonal

6. Projection (20%)

Theory of projections (Elaborate theoretical instructions)

6.1 Introduction to first angle projections

6.2 Drawing 3 views of given objects (atleast 2 objects)

6.3 Drawing 6 views of given objects (Non symmetrical objects may be selected for this exercise)

6.4 Identification of surfaces on drawn views and objects drawn

6.5 Exercises on missing surfaces and views

6.6 Sketching practice of pictorial views form objects

7. Sections (25%)

7.1 Importance and salient features, Methods of representing sections, conventional sections various materials, classification of sections, conventions in sectioning

7.2 Drawing of full section, half section, partial of broken out section, offset sections, revolved sections and removed sections. Exercises on sectional views of different objects

7.3 Drawing of different conventions for materials in section conventional breaks for shafts, pipes, rectangular, square, angle, and channel, rolled sections.

8. Isometric Views (20%)

   8.1 Fundamentals of Isometric Projections (Theoretical instructions)

   8.2 Isometric views from 2 or 3 given orthographic views

9. Symbols and Conventions (5%)

   a) Civil Engineering sanitary fi11ing symbols

   b) Electrical fitting symbols for domestic interior installations.

   c) Building plan drawing with electrical and civil engineering symbols.

10. Preparation of simple working drawing of Furniture items like table, stool etc, (5%)

ME 130 WORKSHOP PRACTICE

	L	T	P
Pds/week	-	-	8

RATIONALE

This course aims at developing generic manual and machining skills in the students. Besides above the development of dignity of labour, precision, safety at work places, team working and development of right attitudes are other objectives.

DETAILED CONTENTS

1. Fitting Shop

   Introduction to tool and measuring instruments, their safe keeping, safety precautions.

   Practical exercises involving sawing, filing, marking, squareness, chipping

2. Welding Shop

   i) Arc welding
   Introduction to tools and equipment, safety precautions, use of welding transformer/welding machine, method of selecting current, choice of electrode.

   Exercises involving surface and edge preparation, making of simple welding joints

   ii) Gas Welding
   Introduction to gas welding equipment, safety precautions, selection of gas pressure welding torch, type of flame, flux, welding rod and welding technique.

   Exercises in involving job preparation and making single joints. Brazing practice of brazing by gas

3. Carpentry Shop

   Identification of wood, introduction to tools, safety precautions.

   Practical exercises involving practice of sawing, planing, chiseling, joining various joints. To make some utility jobs such as brackets, office tray.

4. Pointing and Polishing

   Introducing to paints and allied materials
   Exercises on surface preparation, varnishing, spirit, polishing, painting-using brush and spray, casual painting.

BS-212 APPLIED MATHEMATICS-II

RATIONALE

The course aims at developing analytical abilities in basics of applied mathematics such as: differential and integral calculus and solution of first order differential equations. Besides -applications of the above elements in engineering, the course of study will also provide continuing education base to them.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Differential Ca1cu1us (40%)

1.1 Limits

1.1.1 Concept of a function its value and limit

1.1.2 Evaluation of limits, four standard limits only, namely*;*

$$\lim_{x\to 0}\frac{\sin x}{x};\quad \lim_{x\to a}\frac{x^n-a^n}{x-a};\quad \lim_{z\to\infty}(1+x)^{1/x};\quad \lim_{x\to 0}\frac{a^x-1}{x}$$

1.2 Differentiation

1.2.1 Definition, its physical meaning as rate measurer and its geometrical meaning

1.2.2 Differentiation from first principles of x^n, a^x $\mathrm{Log}X^x$ sin x Cos x, tan x only

1.2.3 Differentiation of Cot x, Sec x, Cosec x and inverse functions

1.2.4 Differentiation of sum, product and quotient of functions

1.2.5 Differentiation of function of a function (chain rule)

1.2.6 Logarithmic differentiation

1.3 Applications:

1.3.1 Rate Measurer

1.3.2 Calculation of Errors

1.3.3 Newtons method of solving equations

1.3.4 Tangent and Normal to a curve for explicit functions only

1.3.5 Maxima and minima

2. Integral Calculus (40%)

2.1 Indefinite integrals

2.2 Physical meaning of integration

2.3 Integration as inverse process of differentiation

2.4 Integration by substitution, by parts and by partial fractions

2.5 Integration of rational and irrational quadratic expressions viz

$$\int \frac{dx}{ax^2+bx+c}, \int \frac{dx}{\sqrt{ax^2+bx+c}} \int \sqrt{ax^2+bx+c}\ dx$$

2.6 Definite Integrals

2.6.1 Evaluation of Definite Integrals

2.6.2 Simple problems of Integration

$$\int \frac{\pi/2\ n}{\sin x\, dx}, \int \frac{\pi/2\ n}{\cos\ dx}, \int \frac{\pi/2\ m \quad n}{\sin x\, dx,\ \ x \quad dx}$$

(without proof)

2.6.3 Numerical integration by Simpson's Rule

2.7 Applications

Simple problems on the area bounded by a curve and axis and volume of a solid formed by revolution of an area

3. Differential Equations (20%)

3.1 Definition

3.2 Formation of differential equations

3.3 Solutions of differential equations of first order and first degree

3.3.1 Variables separable

3.3.2 Homogeneous differential equations

3.3.3 Linear differential equations

BS 213 APPLIED PHYSICS-II

	L	T	P
Pds/week	3	-	2

RATIONALE

Applied Physics is a foundation course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. This course covers basics like Waves, Sound, Light, Electrostatics, Electromagnet ism and D.C circuits. While teaching the subject, teachers should make maximum use of demonstration to make the subject interesting to the students.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Waves (15%)

- Generation of waves by vibrating particles, wave motion and its parameters. Equation of a wave, Energy transfer by particle and wave
- Superposition of waves and interference (graphical)
- Sound and light as waves - frequencies, wavelength and velocities and their relationship.
- Electromagnetic spectrum.

2. Applications of Sound (20%)

Ultrasonics

- Production of ultrasonic waves by musing magneto- striction and piezo-electric methods.
- Applications to drilling cold welding, cleaning, flaw detection and exploration (Sonar).

Acoustics

- Reflection, refraction and absorption of sound waves by surfaces.
- Echo and reverberation
- Reverberation time and its control.

3. Application of Light (10%)

- Refraction and refractive index.
- Defects in image formation (Qualitative), simple and compound microscope, astronomical and Galaleo telescopes and their magnifying powers.

4. Electrostatics (20%)

- Coulomb's law. Unit charge.
- Electric field and electric lines of force
- Concept of electric potential, Unit of potential.
- Electric potential due to point charge and charged sphere.
- Electric intensity due to charged straight conductor and plane sheet.
- Capacitance and its units. Parallel plate capacitor.
- Grouping of capacitors in series and parallel (simple problems).
- Dielectric constant – its functions.

5. D.C. Circuits (10%)

- Ohm's 1aw
- Kirchhoff"s 1 aw
- Wheatstone bridge principle
- Simple problems on series and parallel circuits.

6. Electromagnetism (15%)

- Magnetic fields and its units
- Magnetic field around a current carrying straight conductor;
- Circular loop and solenoids
- Force on a moving charge and current in a magnetic field;
- Force between two current carrying parallel conductors;

- Moving coil galvanometer; Conversion of galvanometer into Ammeter and Voltmeter

- Permeability; Dia, para and Ferro magnetic materials

7. Introduction to Laser, its characteristics and important applications (10%)

LIST OF PRACTICALS

1. To find the velocity of sound by resonance method.

2. Determine the focal length of a convex lens by displacement method

3. Setting up of a model of telescope and determination of, its magnifying power.

4. Verification of Ohm's law

5. To verify series and parallel law's of resistances.

6. Conversion of a galvanometer into an Ammeter, given the resistance of the galvanometer.

7. Conversion of a galvanometer into voltmeter, given the resistance of galvanometer.

BS-214 APPLIED CHEMISTRY

	L	T	P
Pds/week	4	-	2

RATIONALE

Applied chemistry has been considered as one of the core subject for diploma holders in engineering and technology to develop in them scientific temper, appreciation of chemical properties of materials and to develop learning to learn skills in the students. This course will deal with metallurgy, corrosion, fuels. This will equip them to perform various activities effectively. Hence the course.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Structure of Atom (10%)

   Rutherford model of the structure of atom, Bohr's theory of H atom and equation deduced. Quantum numbers and their significance, de-Broglie equation and uncertainty principle. Electronic configuration of 1 to 30 elements

2. Periodic Properties of Elements (10%)

   Periodic law, periodic table, periodicity in properties like atomic radii and volume, ionic radii, ionization energy and electron affinity. Division of elements into s, p, d and f blocks

3. Chemical Bonds (10%)

   Electrovalent, Covalent and Coordinate bond and their properties- Metallic bonding (electron cloud model) and properties (like texture, conductance, lusture, ductility and malleability).Orbital concept of covalence, Hybridisation (simple treatment).

4. Fuel and their Classification (10%)

   Definition, characteristics, classification into solid, liquid and gaseous fuel, Petroleum and brief idea of the <W> <W> into various fraction and their characteristics and uses. Calorific value of fuel, Gaseous fuels-preparation, properties, composition and use of producer gas, water gas and oil gas.

5. Water (10%)

Impurities in water, methods of their removal, hardness of water, its types, causes and removal. Disadvantages of hard water in boilers pH value and its determination by calorimetric method.

6. Problems based on Gravimetric and Volumetric Analysis (5%)

7. Metals (10%)

Cast iron and its properties, effect of sulphur, silicon and phosphorus as impurities in cast iron. Elementary knowledge of heat treatment of steels-hardening, tempering, annealing, normalizing and case hardening

8. Alloys (10%)

Definition, classification and necessity for making alloys. Composition, properties and uses of following alloys : Brass, Bronze, Gun-metal and Duralumin. Effect of carbon, nickel, chromium, manganese on steel.

9. Corrosion (10%)

Its meaning, theory of corrosion, prevention of corrosion by various methods using metallic and non-metallic coatings

10. Plastics and Polymers (15%)

Plastic-thermo-plastic and thermo setting. Introduction of Polythene, PVC, Nylon, synthetic rubber and phenol-form aldehyde resin. Their application in industry.

LIST OF PRACTICALS

1. To find the strength in grams per litre of the given solution of sodium hydroxide with the help of standard oxalic acid solution

2. Find the strength in grams per litre of given sodium hydroxide solution with the help of standard sodium-carbonate solution and intermediate solution of an acid.

3. Determine the total alkalinity ppm in the given sample of water using standard sulphuric acid.

4. To find the amount of chloride ions present in water using, silver nitrate solution (potassium chromate as indicator)

5. Estimate the amount of copper in the given sample of copper sulphate or copper alloy solution using a standard solution of sodium thiosulphate.

6. Estimate the amount of ash in the given sample of coal or coke or charcoal.

7. Estimate the amount of moisture in the given sample of coal or coke.

8. Study the reaction of dilute and concentrated acid with any two metals (iron, copper, zinc, magnesium)

9. To arrange Mg, Zn, Fe, Pb, Sn, Cu according to their activity by studying the interaction of these metals with salt solutions.

10. To determine the pH value of water.

ME-131 ELEMENTS OF MECHANICAL ENGINEERING

	L	T	P
Pds/Week	3	-	2

RATIONALE

The purpose of this course is to impart elementary knowledge about transmission of power, boilers, turbines, IC engines, compressors and material handling techniques which students will come across in their professional life. This will help them in understanding their working principles and usages.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Transmission of Power (25%)

   Uses of belts and ropes, pulleys, different types of pulleys, Chain drive, its comparison with belt drive, gear drive, types of gears, simple gear trains and velocity ratio. Description of single plate disc clutch.

2. Steam Boilers (20%)

   Cocharn boiler, Lanchashire boilers, Babcock and wilcox boiler, their mountings and accessories.

3. Turbines (20%)

   Classification and application of turbines. Elementary study of different types of turbines-construction and working of D 'Level and Parson's turbine, Pelton wheel, Francis and Kaplan turbine

4. IC Engines and Compressors (25%)

   Classification and application of IC engines commonly used spark ignition and compression ignition engines, working principles of two stroke and four stroke Petrol and diesel engines. Ignition systems in Petrol engines, simple carburetor and cooling system of I.C. engines, Construction and working of a simple reciprocating compressors.

5. Material Handling (10%)

   Brief description with special reference to usage of bulldozer, shovel, road roller concrete mixer, crane, travailing gantry crane, screw Jack, hydraulic Jack.

LIST OF PRACTICALS

1. Study of various devices for transmission of power, models of belts, pulleys, gears and chains

2. Study of baby vertical boiler with the help of model

3. Study of Lanchashire boiler with the help of model

4. Study of Babcock and Wilcox boiler with the help of model

5. Study of simple steam turbine with the help of model

6. Study of four-stroke petrol and diesel engines with the help of model

ES-221 ENGINEERING DRAWING-II

	L	T	P
Pds/week	-	-	8

RATIONALE

Engineering Drawing known as the language of engineers is a widely used means of communication among the designers, engineers, technicians, draftsmen and craftmen in the industry. The translation of ideas into practice without the use of this graphic language is really beyond imagination. The diploma holder is required to read and interpret the designs and drawings, provided to student for actual execution of the job. This course aims at building a foundation for further courses in drawing and other allied subjects.

DETAILED CONTENTS

l. Detail and Assembly Drawing (5%)

a) Principle and utility of detail and assembly drawings.

b) Practical exercise on drawing from detail to assembly or vice versa using wooden joints as example.

2. Threads (5%)

a) Nomenclature of threads, types of threads (metric), single and multiple start threads

b) Conventional symbols for V, square and acme threads

c) Left handed and right handed threads

d) External and internal threads

3. Locking Devices: (5%)

3.1 Lock nuts, Castle nuts, Pin nuts, Swan nuts-

3.2 Spring washers, Locking plates

4. Nuts and Bolts (10%)

Different views of hexagonal and square headed bolts and nuts. Assembly of nuts and bolts with washers

5. Screws, Studs and Washers (10%)

5.1 Drawing various types of screws

5.2 Drawing various types of studs

5.3 Drawing various types of washers

6. Keys and Cottons (15%)

a) Various types of keys and cotters and their practical application and preparation of drawing of various keys one sheet

b) Cotter joint and Knuckle joint – two sheets.

7. Couplings (15%)

a) Flange coupling – Protected and Unprotected both.

b) Flexible coupling

c) Muff coupling

d) Split – up Muff coupling

8. Rivets and Riveted Joints (10%)

8.1 Types of rivets

8.2 Types of riveted joints – lap, butt (single cover plate and double cover plate), Chain and Zig-zag riveting

8.3 Caulking and fullering of riveted joints

9. Welded Joints (15%)

a) Various conventions and symbols of welded joints (1S 696)

b) Practical application of welded joints say joints on steel frames, windows, doors and furniture.

10. a) For Mechanical, Automobile and Production Engineering Students only (20%)

Simple exercises on :

(1) Projection of solids and section of solids

(2) Intersection of solids

(3) Development of surface of cylinder, prism, pyramid and cone.

OR

b) For Electrical Engineering Students only (20%)

To draw front elevation, side elevation and/or plan of the following from a given pictorial view:

a) End cover of Induction Motor;
b) Rotor of Squirrel Cage

c) Induction Motor;

d) Motor Body (AC machine);

e) Slip Rings;

f) Pin Type Insulator;

g) Shackle Type Insulator;

h) Field Pole with Coil;

i) Bus Bar Post ;

j) Kit-Kat Fuse Base;

k) Kit-Kat Fuse Carrier ;

l) Dry Type Single Phase Transformer

OR

c) For Civil Engineering Students only (20%)

<u>Preparation of Plan, elevation and side elevation of</u> :

- Dinning Table
- Chairs with arm and without arm
- Simple book rack

ME-230 WORKSHOP PRACTICE – II

	L	T	P
Pds/week	-	-	8

RATIONALE

This course aims at developing generic manual and machining skills in the students. Besides above the development of dignity of labour, precision, safety at work places, team working and development of right attitudes are other objectives.

DETAILED CONTENTS

1. Fitting Shop

   1.1 Description of work bench, work holding devices, care and maintenance of various tools used in fitting

   1.2 Fitting practice., checking by straight edge and try square

   1.3 Specification of files, precautions while filing

   1.4 Introduction to various types of drilling machines (Portable, pillar type, bench type, radical drilling machine etc.)

   Simple exercises including the use of above machines

2. Forging Shop

   2.1 Introduction and demonstration of tools, equipment and operations used in smithy and forging

   2.2 Upaetting operation, production of a blank for a bolt from round bar

   2.3 Exercise on drawing down operation.

   2.4 Exercise involving use of power hammer.

   2.5 Exercise in the making of DE Spanner/Book

3. Sheet Metal Shop

Description of tools and operations involved in sheet metal fabrication such as shearing, bending, joining (Locked groves joint, riveting, soldering Brazing) Exercise like tray. Mug, Funnel etc.

EE – 230 FIELD WORK/EXPOSURE

	L	T	P
Pds/week	-	-	2

The purpose of Field work/exposure is to expose the students to the world of work with a view to create motivation in the students for better understanding and learning electrical engineering courses in the later semesters. Another purpose is to provide appropriate learning experiences which are beyond the facilities at the polytechnic.

Visit to atleast one large, one medium and one small scale industries will provide students understanding about size and scale of operations, industrial environment and culture and the work ethos. These visits will also be helpful to see the functions of the diploma holders in various functional areas of above sectors of employment.

It is proposed that visits to the above industries may be planned well in advance preferably by paying personal visits to each of the <W> organisations. These visits may not be treated as excursions but should be structured in such a way that students are able to differentiate and <W> the working of a large, medium and small scale industry. The students should be shown various functional areas like research and development, design and drawing, planning, shop floor, quality control, repair and maintenance and general administration etc. The teacher will plan the activities well in advance to be undertaken by students during each visit. A guideline alongwith a check list has to be provided to each student before the visit.

1) Visit to one small, and one medium scale unit manufacturing electrical equipment to have the exposure to industrial environment, materials and process used in the industries and field.

2) Visit to one large scale unit manufacturing electrical equipment to have the exposure of the layout of heavy machines, materials and processes used therein.

3) Visit to <W> <w> site (one residential and one commercial/industrial) to study the electrical installation work in such building

Syllabus
Electrical
Engg.
IIIrd Semester

<W> GENERAL <L>

<L>

<W> in the diploma courses of Electrical Engineer one of these subjects is General Engineering. It is to <W> some necessary knowledge and skill about Mechanical <W>. Inclusion of the subject is further justified by the fact that <W> field, any job of electrical technician is <W> with mechanical engineering. As such the relevant basic <W> of these disciplines are included in the content of the subject.

NOTE : Weightage of each topic for external examination is given in the brackets.

DETAILED CONTENTS

1. Properties of Materials: (15%)

   1.1 Mechanical properties of ferrous metals, cast <W> steel alloys.

   1.2 Use of ferrous metals for components used in <W> equipments and machines, shafts, bearings, <W> , frames, transformer tanks, transmission towers, poles and conduits

   1.3 Non ferrous metals for bearings.

2. Bearings and Lubrications: (15%)

   2.1 Different types of bearings used in <W> machines, journal, ball roller, thrust-bearing <W> roller bearings.

   2.2 Friction and heat in bearing , how to <w> them.

   2.3 Common properties and uses of end grades of greases and applications in electrical machines.

3. Fastening and Couplings : (15%)

   3.1 Temporary and permanent type of fastenings, bolts, <W>, screw, <W> and <W> description for use in electrical engineering field

   <W> Couplings Types of couplings
   <L>

4. <W>

4.1 FOUNDRY (10%)

Introduction to patterns and pattern <W>. Introduction to <W> preparation of <W> sand. Different types of moulds cores and their preparation. Machine moulding , melting of iron and non-ferrous metal casting – defects in casting and how to avoid them.

4.2 Sheet Metal Working : (10%)

Sheet metal joints – types, general principles of sheet metal press working, deep drawing of sheets, sheet metal spinning tube drawing

4.3 Metal Forming : (10%)

Forging rolling, wire drawing tube farming, <W> hot and cold metal working.

4.4 Metal Joining Processes: (10%)

Application of welding and riveting for electrical structures in workshops and field e.g. transmission tower power plants etc.

4.5 Metal Cutting Processes : (10%)

Introduction to metal cutting through metal saws, drilling machines, lathes and grinders. Their applications in fabrication of electrical components.

4.6 Various techniques of Fabrication: (10%)

5. CNC Machines: (5%)

Basic ides, specific applications, operations

EE-330 ELECTRICAL SCIENCE

	L	T	P
Pds/week	4	-	3

RATIONALE

An electrical diploma holder is involved in various jobs range <W> from preventive maintenance of machines to fault location <W> circuits, commissioning of new machines and selection of suitable<W> apparatus, designing of small components for improvement. <W> order to carry out these and similar jobs effectively on <W> equipment, circuitry or machinery, specialized knowledge <W> concerned field is essential. This course will provide certain common fundamental concepts, principles and laws to form a foundation for further studies in electrical engineering.

NOTE : Weightage of each topic for external examination <W> given in the brackets.

DETAILED CONTENTS

1. DC Circuits (25%)

   1.1 Concept of electricity, Basic terms Voltage, current, Potential Difference, power, energy and their units.

   1.2 Ohm's law.

   1.3 Effect of temperature on resistance, temperature coefficient of resistance.

   1.4 Resistance in series an parallel.

   1.5 Series and parallel connections of batteries.

   1.6 Kirchhoffs' current law and Kirchhoff's voltage law <W> their application to simple circuits. Conversion of circuits from Star to Delta and Delta to Star

   1.7 Thevenin theorem, Superposition theorem, Norton theorem and their use to solve Simple problems.

2. Magnetism and Electromagnetism : (10%)

   2.1 Introduction of electromagnetism, Magnetic field around a straight current carrying conductor and a <W> and methods to find its direction, force between parallel current carrying conductors.

   2.2 Force on a conductor placed in the magnetic field.

   2.3 <L>

   2.4 Importance of <W>

2.5 <L>

3. Electromagnetic Induction : (15%)

3.1 Faraday's Laws of electromagnetic induction.

3.2 Kenz's <W> law and Flaming's Right and Left hand rules.

3.3 Principle of self and mutual induction, self and mutually induced e.m.f., simple numerical problems.

3.4 Energy stored in a magnetic field.

3.5 Eddy currents and their effect.

3.6 Rise and decay of current in RL and RC circuits.

4. AC Theory : (50%)

4.1 Concept of alternating voltage and current.

4.2 Difference between AC and DC.

4.3 Concept of cycle, frequency, period, amplitude, instantaneous value, average value, r.m.s value, maximum value, form factor and peak factor.

4.4 Representation of sinusoidal quantities by <W>.

4.5 Derivation of equation of sinusoidal wave form.

4.6 Physical concept of alternating voltage applied to pure resistance, pure induction and pure capacitance.

4.7 Inductive reactance, capacitive reactance.

4.8 Alternating voltage applied to resistance and inductance in series.

4.9 Alternating voltage applied to resistance and capacitance in series.

4.10 Impedence triangle and phase angle.

4.11 Complex Numbers – various forms : addition, subtraction multiplication and division ; addition of sinusoidal terms.

4.12 Solution and phasor diagrams for simple practical RLC circuits (series and parallel).

4.13 <L>

Power in pure resistance, inductance and capacitance. Power in combined RLC circuits. Power factor <W> and reactive currents and their significance, practical importance of power factor, solution of simple circuit using <W> notation. Use of conductance, succeptance and admittance.

LIST OF PRACTICALS

1. Determination of voltage – current relationship in a <W> circuit under specific physical conditions and to <W>draw conclusions.

2. To verify that $R_T = R_1 + R_2$ when resistance are in series, and $R_T = (R_1 R_2 / R_1 + R_2)$ when resistance are in parallel.

3. Verification of Kirchhoff's Current Law and Kirchhoff's Voltage law in a dc circuit.

4. To observe the effect of temperature on resistance of a <W> and hence calculate the value of temperature coefficient <W> the winding material.

5. To find the ratio of inductance values of a coil having a core and iron- core respectively and to observe the effect <W> of introduction of a magnetic core on coil inductance.

6. To find the voltage current relationship in a single <W> R-I and R-C Series circuits draw their impedance triangle and determine the power factor in each case.

7. To find the voltage current relationship in a single RLC derives circuit, draw its impedance triangle and determine the power factor.

8. To find out resonance frequency in a R.L.C. circuit.

9. Measurement of power and power factor in a single R.L.C. circuit and to calculate active reactive pulse<W>.

10. Plotting hysteresis is loop of a given magnetic material with the help of a CRO.

EE-331 ELECFTRICAL AND ELECTRONICS ENGINEERING MATERIALS

	L	T	P
Pds/weeks	4 <w>		

RATIONALE

A diploma holder in Electrical Engineering will be involved in maintenance, repair and production of electrical equipment and systems. In addition he may be required to procure, inspect and test electrical and electronic engineering materials, knowledge of various types of materials will be needed in order to execute the above mentioned functions. He may also have to decide for an alternative when a particular material is either not readily available in the market or its cost becomes prohibitive.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Classification: (5%)

   Classification of material into conducting, semi conducting and insulating materials through a brief reference to their atomic structures

2. Conducting Materials: (20%)

   2.1 Introduction

   2.2 Resistivity and factors affecting, alloying and mechanical strength

   2.3 Superconductivity

   2.4 Classification of conducting – material as low resistivity and high resistivity materials

      2.4.1 Low resistivity materials
      2.4.2 Copper:
      Its general properties as conductors, temperature coefficient, density, mechanical properties of hard and annealed copper, corrosion, contact resistance
      2.4.3 Aluminium:
      General properties of conductors, resistivity, temperature coefficients, density, mechanical properties of hard and annealed aluminium, solderability contact resistance
      2.4.4 Steel:
      <L>
      <L>
      <L>
      <L>

<L>
<L>
<L>

<L>
<L>
<L>

Application of special metals <W> Ag, Au, <W> etc

2.3 High resistivity materials and their application manganin, constantin, Nichrome, mercury, platinum and platinum tungsten

3. Semi Conducting Materials: (15%)

3.1 Introduction

3.2 Semi- conductor and their properties

3.3 Different semi- conducting materials used in manufacture of various semiconductors (silicon and germinium)<W>

3.4 Materials used for electronic components, <W> resistors, capacitors, diodes, transistors inductors etc.

4. Insulating Materials; General Properties: (20%)

4.1 Electrical Properties:

Volume resistivity, surface resistance, <w> loss, dielectric strength (breakdown <w>) dielectric constant

4.2 Physical Properties:

Hygroscopieity, tensile and compressive <w> resistance, brittleness

4.3 Thermal Properties:

Heat resistance, classification according to permissible temperature rise. Effect of over <w> the life of an electrical appliance, increase in <w> with the use of insulating materials having <w> thermal stability. Thermal conductivity, <w> thermal breakdown in solid dielectrics

4.4 Chemical Properties

<L>

5. Insulating Material and their applications: (20%)

5.1 Plastics

5.1.1 Definition and classification

5.1.2 Thermo- setting materials:

Phenol – formaldehyde resins (i.e. Bakelite) amino- resins (urea formaldehyde and Melamine- form-aldehyde), epoxy resins – their important properties and applications

5.1.3 Thermo plastic materials:

Poly - vinyl chloride (PVC), Polyethylene, silicons, their important properties and applications

5.2 Natural insulating materials

- Mica and Mica products
- Asbestos and asbestos products
- Ceramic materials (porcelain and steatite)
- Class and glass products
- Cotton
- Silk
- Jute
- Paper (dry and impregnated)
- Rubber, Bitumen
- Mineral and insulating oil for transformers, switchgears, capacitors, high voltage insulted cables, insulating varnishes for coating and impregnation
- Enamels for winding wires

5.3 Gaseous materials; Air, Hydrogen, Nitrogen, and SF

6. Magnetic Materials: (15%)

6.1 Introduction – ferromagnetic materials, permeability, <w> curve, magnetic <w>, hysterisis <w> (including <w> force and residual magnetism).

6.2 Soft Magnetic Materials;

6.2.1 Alloyed steels with silicon, high silicon <w> sheet for transformers, low silicon alloy <w> for electric rotating machines.

6.2.2 <w><w> <w> oriented <w> steels transformers, Non-oriented steels for rotating machines.

6.2.3 Nickel – iron alloys:

6.2.4 Soft Ferrites

6.3 Hard magnetic materials

Fungsten steel, chrome steel, hard ferrites and <w> steel, their applications

7. Material for special purpose: (5%)

Thermocouple , bimetals , lead soldering and fuse <w> mention of their applications

<w> Introduction of various engineering materials necessary fabrication <w> of electrical machines, (motors, <w> transformers etc.) like hollow conductors, foils <w> resins , insulating materials, steels for main shafts ,<w> <w>, oils etc.

<w> The teacher may demonstrate the use of materials different applications bringing the relevant apparatus the room or by taking the students to the laboratory workshops whenever necessary

<w> Students may be given exercise on identification materials used in electrical gadgets, motors etc.

EE- 332 BASIC ELECTRONICS

	L	T	P
Pds/ week	4	-	3

RATIONALE

At present electronic gadgets are being extensively used in manufacturing process in industries, power system operations, communication systems, computers etc. Even for a electrical diploma holder it is absolutely necessary to have a basic understanding of electronic components, their functions and applications. This understanding should facilitate in operation and maintenance equipment which are electronically controlled.

In this course topics like semi conductor physics, electronic components, rectifiers and amplifiers have been included. The remaining topics are included in Electronic devices and circuits.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Brief history of the development of electronics i.e. vacuum tube and solid state devices (5%)

2. Voltage and Current Sources: (5%)

   Concept of voltage and current sources, constant voltage and current sources and their graphical representation. Conversion of voltages source into current source and vice-versa

3. Semi – conductor Physics: (10%)

   3.1 Atomic structure crystalline structure, covalent bonds, generation and recombination, semi conductor materials, intrinsic semiconductors, effect of temperature on conductivity in germanium and silicon

   3.2 Extrinsic, semi-conductors, doping, P&N type semi-conductors, majority and minority carriers, effect of temperature

   3.3 P-N junction, drift and diffusion currents, depletion layer, potential barrier, effect of forward and reverse biasing of a P-N junction. Energy band diagrams. Breakdown mechanisms.

4. Semi- conductor Diodes: (10%)

4.2 Use of diode as half wave and full wave (centre <w> and bridge type) rectifiers. Relation between DC output and AC input voltage

4.3 Concept of ripples, filter circuits: shunt capacitor, series inductor and filters and their applications to reduce ripples

4.4 Diode rating/ specifications

4.5 Zenor diode and its V-I characteristics

5. Transistors: (20%)

Construction of a bi-polar junction transistor with respect to :

5.1 Doping, width and area, working principle of transistors, forward and reversed biasing

5.2 Transistor configurations: Common Base (CB), Common Emitter (CE) and Common Collector (CC)

5.3 Comparison between CB, CE and CC configurations

5.4 Current relations, input and output characteristics in CB and CE configurations

5.5 Applications of transistor amplifier in CE configurations

6. Transistor biasing and Stabilization: (10%)

6.1 Transistor biasing, its need, operating point and need of stabilization of operating point

6.2 Different biasing circuits, limitations, simple problems to calculate operating point in different biasing circuits

6.3 Effect of temperature on the operating point of a transistor

7. Single stage Transistor Amplifier: (20%)

7.1 Basic single stage transistor amplifier circuit in CE configuration, function each part.

7.2 Working of single- stage transistor amplifier, physical and graphical explanation, phase- reversal.

7.3 Concept of DC and AC load line on output characteristics

7.4 Small signal voltage gains.

7.5 Concept of input and output impedance

7.6 AC equipment circuit of single-stage transistor amplifier

8. Regulated Power Supply: (10%)

8.1 Need of regulated power supply. Regulation and stabilization of voltage by Zener diode its limitations

8.2 Block diagram of a regulated power supply

8.3 Transistorised regulated power supply and short circuit protection

9. Construction , working, characteristics and applications of FET, MOSFET, UJT, SCR, DIAC and TRAIC (5%)

10. Electronic Instruments: (5%)

10.1 Cathode Ray Oscilloscope : Block diagram, working of CRO and its various controls . Applications of CRO.

10.2 Construction and working of digital meters like multimeters, non- contact type transformers, frequency meters, single phase energy meters.

LIST OF PRACTICALS

1. Identification of electronic components : Passive component's such as R, L and C, their types, ratings and specifications and colour code. Active components such as diodes and transistors.

2. Plotting V-I characteristics of a semi-conductor diode and finding its dynamic resistance.

3. Plotting V-I characteristics of a Zener diode and finding its reverse breakdown voltage.

4. Observation of input and output wave shapes and verification of relationship between dc output voltage and ac input voltage for a half-wave rectifier.

5. Observation of input and output wave shapes and verification of relationship between dc output voltage and ac input voltage for a full-wave rectifier.

<w>of output wave shapes of a full-wave rectifier (a) shunt capacitor (b) series inductor (c) TT filter <w>

<w> input and output characteristics of a transistor, in configuration.

<w> input and output characteristics of a transistor in configuration.

<w> of operating point (collector current (I c), and Hector emitter voltage, V) in case of :

CE

<W> Fixed base biasing of a transistor
<W> Potential divider biasing of a transistor

<w> observe and note the effect on the performance of a transistor due to change in temperature, also observe the <w> on the performance on replacing the transistor by the <w> number.

<w> measure the voltage gain and to observe and plot phase <w> of signal with CRO for a single-stage transistor <w>

<w> plot frequency response curve of a single- stage <w>transistor amplifier

<w> plot characteristics of a Field Effect Transistor (FET).

EE – 333 ELECTRICAL ENGINEERING DRAWING-I

	L	T	P
Pds/week	-	-	8

RATIONALE

A polytechnic passout in Electrical Engineering is supposed to have good knowledge of designing wiring schemes for domestic and power installation and also to draw layouts for wiring diagram, so that execution job can be undertaken . He is also required to understand and interpret the drawings prepared by others. He should be familiar with the Indian standards and relevant Indian Electricity Rules. The design of the curriculum of this subject is done keeping in view the above requirements.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Electrical and Electronic Symbols: (10%)

   Electrical and Electronics symbols use in Electrical and Electronic installations like light, power, alarm and control circuits etc.

2. Simple Light Circuits: (25%)

   Schematic and wiring diagrams for the following circuits:

   2.1 Light and fan points controlled by individual switches

   2.2 Fluorescent, tube controlled from one switch

   2.3 One lamp controlled by two switches (stair case circuit)

   2.4 Two lamps controlled by three switches (Double staircase circuit)

3. Simple Alarm Circuits without and with relays: (50%)

   Schematic and wiring diagram for the following circuits:

   3.1 One bell controlled by one push button.

   3.2 Two ordinary bells (for day and night) used at a Doctor’s residence.

Bell response circuit using one bell and a relay

Bell response circuit of an office (for three rooms)

Traffic control light system for two road crossing

A light circuit which gets automatically connected to DC supply in case of power failure

<w> Draw circuit diagram of (15%)

series motor started

3 point and 4 point dc starter

EE- 334 ELECTRICAL WORKSHOP PRACTICE-I

	L	T	P
Pds/week	-	-	8

RATIONALE

An electrical diploma holder will be called upon to inspect, test and modify the work done by skilled workers or artisans working under him. In addition, many a times it will become necessary for him to demonstrate the correct method and procedure of doing certain operations. In order to carry out this function effectively in addition to conceptual understanding of the method or procedure he must possess manual skills.

The subject aims at developing necessary competencies and skills required for fault diagnosis, repairing small electrical gadgets/domestic appliances making joints and carrying out wiring work. It also tries to develop understanding of the concepts and practices involved in the manufacturing and servicing various electrical items.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Introduction of Electrical Accessories and wiring materials used in electrical workshop

2. Introduction of tools/equipment used in electrical workshop

3. Study of safety measures and shock treatment

4. Unsheathing Wire baring and bending ears of solid wires

5. Soldering of thimbles to stranded wires

6. Crimping of Thimbles

7. Wire- jointing:

7.1 Straight married joint

7.2 T- joint

7.3 Western Union joint

7.4 Britannia joint

7.5 Twist sleeve joint

7.6 <w> type join

<P>

ENVIRONMENTAL AWARENESS CAMP

An Electrical Engineering Diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and control pollution by pollution controlling measures. He should also be aware of environmental laws for effectively controlling pollution of environment.

DETAILED CONTENTS

This is to be organised at a stretch for 3 to 4 days. Lectures will be delivered on following broad topics. There will be no examination for this subjects.

a) Basic of ecology, eco system and sustainable development

b) Conservation of land reforms, preservation of species, prevention of advancements of deserts and lowering of water table

c) Sources of pollution- natural and man made, their effects on living and non living organisms

d) Pollution of water – Causes, effects of domestic wastes and industrial effluent on living non living organisms

e) Pollution of air – causes and effects of man, animal, vegetation and non living organisms

f) Sources of noise pollutions and its effects.

g) Mining, blasting, deforestation and their effects

h) Legislation to control environment

i) Environment Impact Assessment (EIA), Elements for preparing EIA statements

CM 401 ENGLISH AND COMMUNICATION TECHNIQUES –II

	L	T	P
Pds/week	3	-	-

RATIONALE

Diploma holders are supposed to communicate verbally and in written forms. Further technical report writing forms another essential requirement of these people. Keeping in view above requirements, this subject has been added to develop necessary competencies in written and oral communication. Efforts should be made to give practice of communication to the students

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Precis: (20%)

   Precis writing of simple passages. The passage selected should be such as easily lends itself to summarising. The passage should be of 100 to 150 words.

2. Communication Techniques: (20%)

   2.1 Importance of communication

   2.2 One way and two way communication

   2.3 Essentials of good communication

   2.4 Methods of communication, oral, written and non-verbal

   2.5 Barriers of communication

   2.6 Techniques of overcoming barriers

   2.7 Concept of effective communication

   2.8 Telephonic communications

3. All forms of written communication: notices agenda notes correspondences : (official and business correspondence) memorandum writing, telegrams, circulars, representations, press releases and advertisements (30%)

4. Technical Report Writing: (20%)

   Technical report writing from the given outlines . A choice to attempt one out of three to be given in the examination. The question paper shall provide the required outlines

5. Practice of writing personal resume and writing application for a job/employment (10%)

6. Practice of speaking English

EE- 430 ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS

	L	T	P
Pds/week	4	-	2

RATIONALE

Diploma holding technician has to work on various jobs in field as well as in testing laboratories and on control panels, where he performs the duties of installation, operation, maintenance and testing of measuring instruments. Technician working on control panels in power plants, substations and in industries, will come across use of various types of instruments and has to take measurements.

Instruments used to read and observe the general electrical quantities like current, voltage, power, energy, frequency, resistance etc and their work shapes, have been incorporated in this subject. So the technician will know the construction and use of various types of instruments.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Polyphase System: (15%)

   1.1 Concept of polyphase in power system

   1.2 Advantages of 3-phase system over single phase system

   1.3 Generation of 3-phase voltages, relation between phase voltages and line voltage, phase current, line current and power in a star and delta connected system. Simple problems on 3-phase balanced loads and concept of unbalanced loads.

2. Introduction to Electrical Measuring Instruments: (15%)

   2.1 Concept of measurement and instruments

   2.2 Electrical quantities and instruments for their measurements

   2.3 Types of electrical measuring instruments – indicating, integrating and recording instrument

   2.4 Essentials of indicating instruments – deflecting, controlling and damping torques

3. Ammeters and Voltmeters (moving coil and moving iron type): (5%)

   3.1 Concept of ammeters and voltmeters and difference between them

   3.2 Construction and working principles of moving coil and moving iron instruments

   3.3 Merits and demerits, sources of error and application of these instruments

4. Wattmeters (Dynamometer Type) (15%)

   Construction, working principle, merits and demerits of dynamometer type wattmeter, sources of error

5. Energymeter (Induction type): (15%)

   5.1 Construction, working principle, merits and demerits of single-phase and three- phase energy meters

   5.2 Errors and compensation

   5.3 Simple problems

   5.4 Construction and working principle of maximum demand indicators

6. Miscellaneous Measuring Instruments: (10%)

   6.1 Construction, working principle and application of Meggar, Earth tester, Multimeter, Frequency meter (dynamometer type) single phase power factor meter (Electrodynamometer type). Working principle of synchroscope and phase sequence indicator, tong tester (Clamp- on meter)

   6.2 Instrument Transformers: Constructional details of

      a) CT

      b) PT and their ratio and phase angle error

7. LRC meters. (5%)

8. Power Measurements in 3- phase circuits : (15%)

   8.1 Three wattmeter method

   8.2 Two wall meter method and simple problems

9. Measurement of Non – electrical Quantities: (10%)

Importance of measurement, basic measuring system, block diagram. Brief ,concept of transducers, wire – wound <w> LVDT; strain gauges – types, and applications; Electrical pickups, flow measurements, thermocouples, thermisters, pyrometers; bi-metallic strips, level measurement

LIST OF PRACTICALS

1. Use of multimeter for measuring voltage, current and resistance

2. To calibrate 1-phase energy meter by direct loading method.

3. To measure the value of earth resistance.

4. To measure power, power factor in a 1-phase circuit, using wattmeter and power factor meter and verify results with calculations.

5. Measurement of power and power factor of a three- phase balanced loads by 2-wattmeter method.

6. Measurement of voltages, frequency of a Sinusoidal signal with CRO.

7. Measurement of power in a 3 Phase circuit using CT, PT and 3 Phase energy meter.

8. Connecting appropriate instruments at the supply of an installation to measure supply voltage, frequency, power, maximum demand, Phase sequence, energy consumed

   (Instruments to be used are CRO, VTVM, Maximum demand Indicator, phase sequence indicator, Energy meter and power factor meter)

9. Use of LCR meter for measuring inductance , capacitance and resistance.

10. Connection of 3-phase energy meter in an electrical system in measurement of energy.

EE-431 ELECTRONIC DEVICES AND CIRCUITS

	L	T	P
Pds/week	4	-	2

RATIONALE

The purpose of the introduction of electronics in the electrical engineering diploma course has been already explained in the rationale of the subject Basic Electronics. In this course topics like Amplifiers, Oscillators and wave shape circuits have been dealt with.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Multistage Transistor Amplifier: (15%)

   1.1 Review of single – stage transister amplifier

   1.2 Need of multi – stage transistor amplifier – different types of couplings and their purpose and applications

   1.3 Important terms in amplifiers : gain , frequency response, decibel gain and band width

   1.4 RC coupled amplifier: circuit details, working, frequency response, applications.

   1.5 Loading effect in multi-stage amplifier

   1.6 Elementary idea about direct coupled amplifier, its limitations and applications

   1.7 Voltage gain at mid frequency response (physical idea), upper and lower cut- off frequencies

2. Transistor Audio Power Amplifier: (15%)

   2.1 Difference between voltage and power amplifier

   2.2 Important terms in Power Amplifier: collector efficiency, distortion and dissipation capability

   2.3 Classification of power amplifier : class A,B and C

   2.4 Class A single- ended power amplifier, its working and collector efficiency

   2.5 Impedance matching in a power amplifier through transformer

   2.6 Heat sinks in power amplifiers

2.7 Push pull amplifier: circuit details, working, and advantages (No mathematical derivation)

2.8 Principle of the working of complementary symmetry push- pull amplifier

3. Tuned – Voltage Amplifier : (No mathematical derivation) (5%)

Brief idea of tuned – voltage amplifiers

4. Feedback in Amplifiers: (10%)

4.1 Feedback, its importance, positive and negative feedback, and their need

4.2 Voltage gain of an amplifier with negative feedback
$A_{fb} = A/(1+AB)$

4.3 Effect of negative feedback on voltage gain, stability distortion, band width, output and input impedance of an amplifier (No mathematical derivation)

4.4 Typical feedback circuits:

a) Effect of removing the emitter by – pass capacitor on an ordinary CE transistor amplifier

b) Emitter follower and its applications

5. Sinusoidal Oscillators: (10%)

5.1 Sinusoidal Oscillators – positive feedback in amplifiers

5.2 Difference between an oscillator and an alternator

5.3 Essentials of an oscillator

5.4 Circuit details and working of LC oscillators viz Tuned Collector, Hartley and Colpitt's oscillators

5.5 R-C oscillator circuits: phase shift and Wein bridge oscillator circuits

5.6 Introduction to piezoelectric crystal and crystal oscillator circuit

6. Wave- Shaping and Switching Circuits: (10%)

6.1 Concept of Wave- shaping

6.2 Wave shaping circuits :

6.2.1 I R-C differentiating and integrating circuits
6.2.2 Diode clipping circuits

6.2.3 Diode clamping circuits
6.2.4 Application of wave-shaping circuits

6.3 Transistor multivibrator circuits

6.3.1 Transistor as a switch (explanation using CE transistor characteristics)

6.3.2 Collector coupled as table, monostable, bistable multivibrator circuits (explanation using wave shapes). Brief mention of uses of mu1tivibrators.

6.3.3 Working and applications of transistor inverter circuit using power transistors

7. Working principle of different types of power supplies viz CVTs, UPS, and Stabilizers etc. (10%)

8. Operational Amp1ifiers: (10%)

Adder, summer, differentiator, integrator, inverting amplifier, non- inverting amplifier and voltage follower

9. Digital Techniques (10%)

Binary, octal, hexadecimal numbers and its conversion, logic gates, AND, OX, NOT, XOR, X-NOR gates, Half adder, full adder

LIST OF PRACTICALS

1. Familiarity with different electronic components e.g. capacitors, coils, transformers, micro switches, proximity switches heat sinks, IC bars, PCBs, etc.

2. To measure voltage gain of first stage and voltage gain of combined two stages, of R-C coupled amplifier working at a particular operating point

3. To plot frequency response curve of R-C coupled amplifier and compare its band width with that of a single-stage amp1ifier

4. To measure the effect of the change in value of coupling capacitor on lower cut off frequency in two stages R-C coupled amplifier

5. To measure (a) optimum load (b) output power in Class A single-ended transistor amplifier

6. To measure (a) optimum load (b) output power (C) Signal handling capacity in a push-pull amplifier

7. To measure voltage gain and plot the frequency response curve of single-stage feedback amplifier when by-pass capacitor is removed
8. To measure (a) Voltage gain, (b) input and output impedance for an emitter follower circuit

9. To measure frequency generated in (a) Hartley (b) Colpitt and (c) Wein bridge oscillators

10. To observe the differentiated and integrated square wave on a CRO for different values of R-C time constant

11. i) Clipping of one portion of sine-wave using diode

    ii) Clipping of both portion of sine-wave using:

        a) diode and dc source

        b) zenor diodes

    iii) Clamping a sine-wave to:

        a) negative dc voltage

        b) positive dc voltage

12. To generate square-wave using an astable multivibrator and to observe the wave form on a CRO

13. To observe inggering and working of a bistable multivibrator circuit and observe its output wave forms on a CRO

EE - 432 ELECTRICAL MACHINES-I

	L	T	P
Pds/week	4	-	4

RATIONALE

Knowledge of various types of electrical machines including their performance characteristics is necessary to enable a diploma holder in Electrical Engineering to select, operate, maintain, test and repair/replace electrical machinery used in various industrial and domestic applications.

Knowledge of various parts and their construction is also necessary when the diploma holder is placed in a manufacturing industry.

The common type of electrical machines he deals with are do machines, transformers, synchronous machines, induction motors, etc. In this semester, a generalised approach to understand electrical machines, dc machines and transformers are included.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Generalised Treatment of Electrical Machines: (10%)

   1.1 Definition of motor and generator

   1.2 Torque due to alignment of fields and the concept of torque angle

   1.3 Electromagnetic EMF

   1.4 Elementary concept of an electrical machine

   1.5 Application of the concept of alignment of magnetic fields to the explanation of :

      1.5.1 DC machines

      1.5.2 AC machines eg Alternators and Induction Motors

2. DC Machines: (40%)

   2.1 Main constructional features

   2.2 Function of the commutator for motoring and generation action

   2.3 Factors Determining induced emf

   2.4 Factors determining the electromagnetic torque

3.1.3 Auto transformer construction working and app1ications

3.1.4 Instrument transformers, construction, working and applications

3.1.5 Isolation Transformer

3.1.6 Maintenance schedule of a transformer

3.1.7 Troub1e shooting on a Transformer

4. Three phase Transformer: (10%)

4.1 Construction of three phase transformers

4.2 Types of three phase transformers i.e. delta-delta de1ta - star, star-delta and star-star

4.3 Difference between power and distribution transformer

4.4 Conditions for parallel operation

4.5 On load tap changer

NOTE:

Students should be taken to Motor and Transformer manufacturing. Repairing units for field visit during the course of this subject.<W>

LIST OF PRACTICALS

1. Measurement of the angular displacement of rotor of the three phase synchronous machine with respect to the stator on application of DC to the field winding and simultaneously to each phase-winding in sequence

OR

Measurement of the angular displacement of the rotor of a slip-ring induction motor on application of DC to stator phase winding in sequence and simultaneously to each phase of rotor winding

2. Measurement of the induced emf of a separately excited DC machine as a function of the field current.

Measurement of the terminal voltage of separately excited <w> <W> <W> function of the load current.

4. Measurement of the terminal voltage of a DC shunt <w> as a function of the load current

5. Measurement of the speed of DC series motor as a function of the load torque:

   a) at rated armature-voltage
   b) at 50% of the rate armature voltage
   c) at rate armature voltage but with an appropriate resistance in series with the armature.

6. Determination of the efficiency of a DC shunt motor by separate measurement of the losses (Swinburne's method)

7. Determination of the efficiency of a DC motor by direct method

NOTE :

Swinburne's and direct method should be performed on the same machine and results compared

8. To observe the wave-shape of the no load current of a transformer by means of an oscilloscope

9. Determination of the efficiency and regulation of a single phase transformer by means of open-circuit and short circuit test at

   (i) full load
   (ii) half load
   (iii) quarter load and
   (iv) no load

10. Checking the polarity of the windings of a three phase transformer and connecting the windings in various configurations.

11. Finding the voltage and current relationships of primary and secondary of a three phase transformer under balanced load in various configurations conditions.

EE-433 ELECTRICAL ENGINEERING DRAWING-II

	L	T	P
Pds/week	-	-	8

RATIONALE

A polytechnic passout in Electrical Engineering is supposed to have good knowledge of designing wiring schemes for domestic and power installation and also to draw layouts for wiring diagram, so that execution job can be undertaken. He is also required to understand and interpret the drawings prepared by others. He should be familiar with the Indian standards and relevant Indian Electricity Rules. The design of the curriculum of this subject is done keeping in view the above requirements.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. House Wiring: (20%)

   Installation Plan, single line wiring diagram, selection and rating of necessary equipment and to prepare a list of material required for electrical wiring of a small house (in batten/concealed conduit system). Determination of sizes of distribution boards for multistoried buildings. Introduction to concept of rate scheduled

2. Service Line Connection: (10%)

   Layout diagram (from supply pole to building) and to prepare a list of material required for giving a service line connection (For single phase and three-phase small loads)

3. Power wiring for a small workshop: (10%)

   Installation plan, sing1e line wiring diagram. Selection and rating of necessary equipment and to prepare a list of material required for a small workshop. Determination of sizes of panels for given loads. Introduction to concept of rate schedule

4. Contactor Contro1 Circuits: (50%)

   Schematic diagram of control circuit and complete wiring diagram of the fo1lowing:

   4.1 DOL starting of 3-phase induction motor

   4.2 Remote Control of 3- phase induction motor

   4.3 3-phase induction motor getting supply from selected feeder

<w> a 3-phase induction moor

<L>

<w> <L>

<w> <L>

<w> Automatic star delta starter for 3-phase induction Motor

5. Sub-Stations (10%)

5.1 Single line circuit and layout plan of 11/0.4 kV indoor outdoor Substation (i.e key diagram)

5.2 Single line circuit and layout plan of 66/11/0.4 kV outdoor substation with 11 KV indoor switchgear (key diagram)

EE-434 ECTRICAL WORKSHOP PRACT ICE-II

	L	T	P
Pds/week	-	-	8

RATIONALE

When working as a supervisor, an electrical diploma holder technician will be called upon to inspect, test, and modify the work done and installation made by skilled workers or artisans working under him. In addition, many a times he himself has to test installations, control panels, and to check the circuit connections and to demonstrate the correct method and procedure of doing certain operation. In order to carry out these functions of repairs, installation and testing effectively in addition to conceptual understanding of methods or procedure he must a1so possess manual skills.

This subject aims at developing special skills required for doing industrial installation, laying cables, earthing, installing motors with their accessories, wiring resting of contractor control circuits and motor winding.

DETAILED CONTENTS

1. Wiring, testing and fault detecting of the following contactor control circuits operating on 3 phase supply.

    1.l Remote Control circuits

    1.2 Time delay circuits

    1.3 Inter locking circuits

    1.4 Sequential operation control circuits

2. To carry out pipe earthing for a small house or a small 3 phase motor

3. Installation of a 3-phase motor with main switch and starter

4. Dismantling, assembling and repair of DOL starter and star delta starter

5. Winding/re-winding of a fan and choke

6. Fault finding in single phase and three phase motors and their rectification

7. Three phase motor winding

8. Power cable jointing (Demonstration if kit not available)

9. Laying of under-ground cables (Demonstration)

ENTREPRENEURSHIP AWARENESS CAMP

This is to be organised at a stretch for two to three days towards the end of Fourth Semester. Subject matter experts may be called to deliver lectures on the following broad topics.

1. Who is an entrepreneur.?

2. Need, for entrepreneurship, entrepreneurial career and wage emp1oyment.

3. Scenario of development of small scale industries in India.

4. Entrepreneurial history in India, Indian values and entrepreneurship.

5. Assistance from District Industries Centers, Commercial Banks, State Financial Corporations, Small Industries Service Institutes, Research and Development Laboratories and other financial and development corporations.

6. Considerations for product selection.

7. Opportunities for business, service and industrial ventures.

8. Learning from Indian experiences in entrepreneurship (interaction with successfu1 entrepreneurs).

ES-122 INTRODUCTION TO COMPUTERS

	L	T	P
Pds/week	-	-	4

RATIONALE

Computers have made great inroads into engineering design, personnel administration, project planning and monitoring, banking, transportation, automatic machine operation and many other areas of human endeavour. During the past decade, the use of computers has been growing at fast rate. The time has now come when engineering technician has to familiarise themselves with computers to enable them to cope with the inevitable computerisation of a significant portion of their job. Hence this subject. This is a practical course. Theory if any may be dealt in the practical session only.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Introduction to Computer: (20%)

   1.1 Block diagram of a computer and overview of its working

   1.2 Basic concepts in stored programme execution

   1.3 Input, output and secondary storage devices

   1.4 Concept of RAM (Random Access Memory), ROM (Read Only Memory)

   1.5 Introduction to operating system. Compilers, Assembler, Loader, Linker, Programming Language.

   1.6 Types of computers - Micro (PC, PC-XT, PC-AT), Mini, Main Frame and Super Computers - their capabilities

2. Familiarization with Computer and MS-DOS: (20%)

   2.1 Identification of subsystems and terminology

   2.2 Interconnecting various external units including computer

   2.3 Introduction to files

2.4 Booting the system from floppy and hard disk

2.5 Selection of drive

2.6 Organizirig in formation on a disk

2.7 Formatting floppies, disks

2.8 Creating and working with directories

2.9 File operations such as copying, renaming and deleting

2.10 Printing files

3. Word processing: (20%)

3.1 Opening a document

3.2 Preparing a document

3.3 Editing document

3.4 Character, word and line editing

3.5 Margin setting, paragraph alignment

3.6 Block operations

3.7 Spell checker

3.8 Saving document

3.9 Applying Print control

3.10 Printing a document on a dot-matrix printer or which is avai1ab1e

4. SPREAD SHEET: (20%)

4.1 Application of spread sheet

4.2 Structure of a spread sheet

4.3 Preparing spread sheet for simple data and numeric operations

4.4 Using formulae in spread sheet operations

4.6 Making tables , Sorting.

4.7 Creating of graphs pie charts, bar charts

EE-531 ELECTRICAL MACHINES-II

	L	T	P
Pds/week	4	2	4

RATIONALE

<W>purpose of including electrical machines in this diploma <W> is already explained under Electrical Machine-I. The <W> topics of electrical machines namely, Synchronous <W>, poly-phase induction motors, single phase induction <W>, commutator motors and special types of other electrical <W> are included here.

NOTE : Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

<W>. Synchronous Machines: (40%)

1.1 Main constructional features

1.2 Generation of emf

1.3 Generation of three phase emf

1.4 Three phase winding

1.5 Production of rotating magnetic field in a three phase winding

1.6 Concept of distribution factor and coil span factor and emf equation

1.7 Armature reaction

1.8 Operation of single synchronous machine independently supplying a load

l.8.l Voltage regulation by synch-impedance method

1.9 Operating a synchronous machines when connected to infinite bus bars

1.9.1 Effect of change of excitation
1.9.2 Effect of change of torque

1.10 Parallel operation of two alternators

1.11 <L>

1.12 Starting and operation of synchronous machines with different excitations.

4.8 Printing

5. COMPUTER AIDED DRAFTING: (20%)

5.1 Making simple drawing using features of conforming the drafting specifications

5.2 Saving and retrieving drawings

5.3 Dimensioning

5.4 Lettering

5.5 Plotting drawings on plotter or printer

1.13 Concept of Hunting

1.14 Rating and cooling of synchronous machines

1.15 Applications of synchronous machines

1.16 Maintenance schedule of alternators and synchronous motors

2. Induction Motors: (40%)

2.1 Salient constructional features of Squirrel-Cage and Slip-Ring Induction motor

2.2 Principle of operation

2.3 Locking of rotor and stator fields

2.4 Rotor current

2.5 Rotor torque

2.6 Relationship between the rotor I^2 R loss and the motor slip

2.7 Factors determining the torque

2.8 Effect of rotor resistance upon the Torque-Slip relationship

2.9 Double cage rotor motor and its applications

2.10 Starters of induction motors, DOL, star-delta, auto transformer and rotor resistance starter

2.11 Causes of low power factor of induction motors

2.12 Testing of 3-phase induction motors as per Indian Standards

2.13 Installation and maintenance of induction motors

3. Fractional K.W. (FKW) Motors: (10%)

3.1 Single phase induction motors; Construction, characteristics and applications

3.1.1 Nature of field produced in single phase induction motor
3.1.2 Split phase induction motor
3.1.3 Capacitors start and run motor
3.1.4 Shaded pole motor
3.1.5 Reluctance start motor

3.2 Alternating current series motor and universal motors

3.3 Single phase synchronous motor

i) Reluctance motor
ii) Hysteresis motor

4. Specia1 Purpose Machines: (10%)

4.1 Construction and working principle burshless generator and three brush generator

4.2 Construction and working principle of Eddy drives for variable speed operations

LIST OF PRACTICALS

1. Synchronous machines:

1.1 Determination of the magnetisation curve of an alternator (i) at rated speed and (ii) half rated speed

1.2 Determination of Excitation required to maintain constant voltage in an alternator at varying load

1.3 Determination of the relationship between the voltage and load current of an alternator, keeping excitation and speed constant

1.4 Determination of the regulation arid efficiency of alternator from the open circuit and short circuit test

1.5 Parallel operation of polyphase alternators and load sharing

1.6 Determination of the effect of variation of excitation on a synchronous motor

2. Induction Machines:

2.1 Determination of efficiency by (a) no load test and blocked rotor test on an induction motor (b) direct loading of an induction motor

2.2 Determination of effect of rotor resistance on torque speed curve of an induction motor and finding out the effect of single phasing

3. <W> Motors:

Determination of the <w> of various capacitors on the starting and running of single phase induction motor. Methods of reversal of rotation.

EE-532 GENERATION, SWITCHGEAR AND PROTECTION

	L	T	P
Pds/week	3	2	4

RATIONALE

In view of the complexities associated with the modern interconnected power stations, the responsibilities and the job requirements of a diploma passout have become more complex than what they used to be earlier. He is required to work with modern electrical equipment and maintain reliability of supply.

The course is designed to understand the concepts, principles involved in the construction and working of protective switch gear system so that one can handle, install, maintain them and also take decisions at his/her level in different situations.

The teaching of this subject requires reinforcement in the form of visits to substation, power stations and well designed laboratory experiences. A practice oriented approach to the teaching of this subject is suggested

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Generation (30%)

   1.1 Growth and development of Electrical power in country. Main sources of energy; conventional and non-conventional

   1.2 Different types of power stations thermal, hydro, diesel and nuclear power Nations. Their layout, flow diagram and brief explanation of operation, comparison of power stations on the basis of capital cost, running cost, efficiency, space, maintenance and availability of the resources.

   1.3 Load estimation, load curves. Demand factor, load factor, Diversity factor, Simple problems there on.

   1.4 Base and peak load power stations. Interconnection of power station and its advantages. Concept of regional and nationa1 grid

2. Various Faults: (10%)

   2.1 Types of faults, short circuit fault, simple problems for calculating short circuit currents for symmetrical fault, concept of a fault level

3. Switchgear System (20%)

3.1 Purpose of protective gear. Difference between switch, isolator and circuit breakers. Function of isolator and circuit breaker. Breaking capacity of circuit breaker.

3.2 Circuit breakers. Types of circuit breakers, oil circuit breakers, air blast circuit breakers

3.3 Principles of Arc extinction by OCB and ACB, Constructional features of OCB, ACB, and their working, Rating of Circuit breakers and their maintenance schedule

3.4 Introduction to sulphur hexaflouride (SF_6) and vacuum circuit breaker

3.5 Miniature circuit breakers and RCCB, ACB, ELCB, MCB, VCB for distribution system and transmission (Descriptive)

4. Protection Devices: (20%)

4.1 Fuses; function of fuse, Classification of fuses, HV and LV fuses, their Characteristics. Types, rewireable, cartridge, HRC types

4.2 Earthing, purpose of earthing: System earthing, Equipment earthing, Substation earthing, system earthing as per Indian Electricity rules.

4.3 Relays:

a) Function, use in protection system. Types of relays. Introduction, Electromagnetic and thermal relays. Their construction and working

b) Induction type overcurrent, earth leakage relays

c) Directional overcurrent, differential over-current relays, their characteristics. Time and current setting

d) Idea of static relays

5. Protection Scheme: (10%)

5.1 Protection of alternator; Merz Price protection

5.2 Protection of transformers; Merz Price Protection.

5.3 Protection of feeders and bus bars. Over current and earth leakage protection

6. Overvoltage Protection: (5%)

6.1 Protection of system against over voltage; causes of over voltage, function of ground wire

6.2 Lightening arresters, Rod gap, horn gap, thyrite arrestors. Surge, absorbers

7. Carrier Communication: (5%)

7.1 Principle and purpose of carrier communication over power lines

7.2 Brief description of equipments with block diagram

LIST OF PRACTICALS

Visit to power station/sub-stations for the conduct of following practicals.

1. Testing of the dielectric strength of transformer oil
2. Working of different types of circuit breakers and isolators.
3. Working of different types of protective relays.
4. Working of CTs and PTs.
5. Earthing of different equipment.
6. Working of carrier communication system.
7. Study of power transformer protection scheme
8. Working of lightening arresters.
9. Study of static excitation of the generator.
10. Study of transformer and alternator protection.
11. Power factor improvement of a single phase load using capacitor bank

EE-533 TRANSMISSION AND DISTRIBUTION OF ELECTRICAL POWER

	L	T	P
Pds/week	3	2	-

RATIONALE

The majority of the polytechnic passouts have to perform various activities in the State Electricity Boards in the field of Generation, Transmission and Distribution of Electrical power. The range of these activities vary from simple administrative jobs to public relations, operation and maintenance of equipments, lines, fault location, planning and designing of simple distribution schemes, and executive and supervisory; control in power stations, transmission and distribution networks.

In order to develop knowledge and skill in the students so that they are able to handle the various jobs as mentioned above, they are expected to be imparted training by framing syllabus including such topics in the subject of Transmission, and Distribution and Generation, Switchgear and Protection System.

In order to provide practical orientation to the students, they are expected to visit power stations, sub-stations, and appropriate use of audio-visual aids in these subjects.

They should also be made aware of recent developments, current : practices in the Electricity Boards to keep them abreast with modern techniques in Generation, Transmission and Distribution of Electrical Power.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1 Transmission Systems: (30%)

1.1 Layout of transmission system; Effect of increase of voltage on (a) weight of copper (b) efficiency of line and (c) line drop; practical working voltage for generation transmission and distribution.

1.2 Comparison between : (a) three phase and single phase system (b) Overhead and underground transmission system, (c) hvac and hvdc transmission system.

1.3 Constructional features of transmission lines:

Types of supports, types of insulators, Selection of
<L>
<L>

1.4 Mechanical features of line: Importance of sag, calculation of sag at level supports, effects of wind and ice simple problems; Indian electricity rules pertaining to clearance

1.5 Electrical features of line: Concept of resistance, inductance and capacitance in a.c. transmission line (single phase, three phase); simple problems on efficiency and regulation of short lines; physical concept of corona. Effects of corona and remedial measures

1.6 HVDC transmission lines : salient features, advantages description of system to block diagram, ground return.

2. Distribution System: (30%)

2.1 Lay out of HT and LT distribution system:
Constructional feature of distribution lines and their erection. LT feeder, distributor and service mains; Simple problems on AC distributor fed at one end, both ends and determination of size of conductor

2.2 Construction of LT and HT underground power cables, laying of cables, different methods, comparison of overhead and underground distribution systems

2.3 Estimation of LT and HT overhead distribution lines.

3. Substations: (10%)

3.1 Brief idea of, substations; grid sub-station 220/132 KV, outdoor power substations, indoor and pole mounted substations

3.2 Layout of 33/11 KV distribution substation and various accessories and equipments

3.3 Estimation of 11 KV/440 V pole mounted substation

4. Faults: (10%)

4.1 Common type of faults in lines (i.e. overhead and underground)

4.2 Location and testing of faults in underground cables

4.3 Maintenance schedule of Tines

5. Power Factor: (10%)

5.1 Concept of power factor

5.2 Causes and disadvantages of low power factor

5.3 Economics of Power factor improvement, Methods of improvement using static and synchronous condensers and simple problems

6. Various types of tariffs: (10%)

6.1 Types of tariffs

6.2 Block rate, flat rate, maximum demand and two part tariffs

6.3 Simple problems

EE-534INSTALLATION, COMMISSIONING OF ELECTRICAL EQUIPMENT (EXCLUDING REPAIR AND MAINTENANCE)

	L	T	D
Pds/week	4	-	-

RATIONALE

In his career as a supervisor, an electrical engineering technician will be called upon to install, erect, and commission the power equipment. Many a times it will become necessary for him to demonstrate the correct procedure of doing certain operations. In order to carry out this function effectively he must have knowledge of tools and accessories; electricity rules, transmission and distribution lines, cables, substation equipment and testing procedure.

This subject aims at developing skills required for electrical installation, making joints and carrying out wiring work, testing, detecting faults and removing the same. Hence the subject.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Tools and accessories required for installation work (10%)

2. Introduction to Indian Electricity Rules relating to transmission and distribution lines and domestic installations, Installation drawings and their interpretation (10%)

3. Transmission and Distribution Lines: (20%)

   Planning of work in respect of material, transport, staff and labour, tools and plant; survey, planning, and clearing of line <W>; right of way, tree learance and final marking of routes; erection or steel ‘structures. connecting of jumpers, tee-off points, joints and dead ends; crossing of roads, power/telecommunication lines and railway crossings, clearances; earthing of equipment and guarding, spacing and configuration of conductors; arrangement for suspension and strain insulators, bird guards,; anti-climbing devices and danger plates; sizes of conductor, earthwire and guy wires, Testing and Commissioning.

4. Underground Cables: (20%)

   Inspection, transportation, handling, and storage of cables, cable handling equipment, parameters for survey and selection of route cab1e laying depths and clearances from other services such as; water, sewerage, gas, heating and other mains, power and telecommunication cables;

coordination with these services before laying of cables, excavation of trenches, direct cable laying (including laying of cable from the drum, laying cable in the trench, taking all measurements, making route maps, backfilling of trenches with earth or sand, laying protective, layer of bricks etc), laying of cables on bridges, across a stretch of water, into pipes and conduits and within buildings, introduction to cable jointing compounds, epoxy resins and hardeners, cable jointing and terminations, testing and commissioning.

5. Elementary idea, regarding dispatch, inspection, storage and handling of transformers, Pole mounted substations, plinth mounted substations, grid substation, installation, of busbars, isolating switches, voltage and ‘ current transformers, lightening arrestors, control and relay panels, shunt capacitors, reactors, HT/LT circuit breakers, LT switches, power/distribution, transformers and their dehydration, Oil tests, earthing system, batteries and other auxiliaries, fencing of yard, equipment foundations and trenches. Testing and commissioning of transformers and switchgears. (20%)

6. Installation, testing and commissioning of electrical installations in a big industry including high voltage transformers and its connected equipment in the switch yard, medium voltage distribution panels, power control centres, motor control centres, lighting arrangement, storage, pre- installation checks, installation, alignment, connecting and starting, pre-commissioning checks, drying out, Causes of fire, precautions to avoid fire, types of fire fighting equipment and their uses. Commissioning of fire fighting equipment. (20%)

EE-540(b) ELECTRIC TRACTION

	L	T	P
Pds/Week	4	-	-

RATIONALE

Modern trend in public transportation is towards fast moving traction system. Old methods have become rendered obsolete as they are not cost efficient, and new dependable systems such as electric traction systems are catching up. Emphasis is also being laid on safety alongwith economy and efficiency. In India, a large portion of railway tracks are electrified and remaining will be converted into electrified lines during coming five year plan. The technician graduates are employed in sufficient numbers in Railways for various jobs starting from planning, execution, operation and maintenance of electric traction system.

This subject will provide background knowledge regarding various traction systems, system of power supplies, over head equipment, drives, control mechanism for motors etc.

DETAILED CONTENTS

1. Introduction to Traction Systems (10%)

   Introduction to different traction systems like steam, diesel, electric traction and trolley buses; advantages of electric traction over other methods of traction systems

2. Systems of Power Supply (20%)

   Different methods of power supply systems: AC single phase, 3-phase, DC systems and composite; systems; rectification of power for traction systems; Economics of supply systems; Location of supply points; Neutral sections; Interference with Communication systems

3. Over Head Equipment (20%)

   Single and compound catenary construction in Railways; position of contact wire in relation to trac under various circumstances like tunnels and curvatures; General consideration on support and insulations of trolley bus routes; sectionalisation of over head line; current collector systems; pentograph

4. Study of Drives (20%)

   Performance of DC series motor, AC series' motor and induction motors on traction systems: method of obtaining good power factor and commutation on AC series motors; Special design features of traction motors; mechanics of train movements typical speed time carve on sub-urban and main line services; co-efficient of adhesion; Train resistance

5. Control of Motors (20%)

Methods of starting; metadyne systems; different methods of Electric braking, plugging, Rheostatic and regenerative braking in AC and DC systems; control of speed by cutting a field turns, speed control by solid state devices for AC and DC motors; high acceleration Linear Induction Motor's

6. Rai1 and Return Path (10%)

Limiting voltage between the earth; Application of negative booster; Distribution of current and voltage on the rail; Earth return protection of underground installation against corrosion

EE-540 (c) INSTRUMENTATION

	L	T	P
Pds/week	4	-	-

RATIONALE

This subject deals with the various instruments, their construction and working which control the various parameters and operations in any industry. Electrical supervisor employed in maintenance of electrical equipment, machinery is required to diagnose faults, rectify them and test the total system for good performance. Thus there is a need of introducing diploma holders to the basics of Instrumentation.

DETAILED CONTENTS

1. Measurements (10%)

   Importance of measurement, Basic measuring systems, advantages and limitations of each measuring systems, generalised measurement system, signal conditions and display devices

2. Transducers (15%)

   Theory, construction and use of various transducers (resistance inductance, capacitance, electromagnetic, piezo electric type)

3. Measurements of Displacement and Strain (20%)

   Displacement Measuring Devices : wire wound potentiometer, LVDT, strain gauges, different strain gages such as inductance type, resistive types wire and foil etc. Gauge factor, gauge materials, and their selections, sources of errors, and its compensations. Use of electrical strain gauges, strain gauge bridge amplifiers.

4. Force and Torque Measurements (20%)

   Different types of force measuring devices and their principles, load measurements by using elastic Transducers and electrical strain gauges. Load cells proving rings. Measurements of torque by brake, dynamometer, electrical strain gauges, speed measurements; different methods, devices.

5. Pressure Measurements (10%)

   Bourdon pressure gauges, electrical pressure ups their. Principle, construction application use of pressure cells.

6. Flow Measurements (5%)

Basic principle of magnetic and ultrasonic flow meters

7. Measurement of Temperatures (20%)

Bimetallic thermometer, pressure thermometers, thermoelectric thermometers, resistance thermometer, thermocouple, thermisters and pyrometer, errors in temperature measurements in rapidly moving fluids. Temperature recorders.

EE-540 (d) POWER ELECTRONICS

	L	T	P
Pds/week	4	-	-

RATIONALE

Power Electronics plays a very vital rule in the field of control engineering in the modern industries as these industries mostly use electronic controls which are more efficient, effective and accurate. The old magnetic and electrical control schemes have become obsolete. Knowledge of components like general purpose integrated circuits, thyristers, UJTs, power diodes, power transistors and microprocessors is a must for the persons working as supervisors as they-have to maintain the panels used in the modern control processes. The syllabus of this subject deals with the applied power electronics needed for the electrical diploma holders.

NOTE: Weightage of each topic for external examination is given in the brackets

DTAILED CONTENTS

1. Basic Power Control Devices and Circuits: (35%)

   1.1 Introduction to Thyrister family, Construction and working principle of an SCR, two-transistor equivalent circuit of SCR, V-I characteristics of SCR

   1.2 SCR specifications

   1.3 Construction and working principles of diacs and triacs and their V-I characteristics

   1.4 Basic ideas about the selection of heat sinks for SCR and Triac

   1.5 SCR triggering mechanisms

      1.5.1 UJT, its construction, V-I Characteristics

      1.5.2 Working of UJT relaxation oscillator, idea of Pulse triggering

      1.5.3 Triggering of SCRs by UJT and diac

      1.5.4 Resistance and R-C triggering circuits

1.6 Commutation of SCRs

1.6.1 Natural Commutation

1.6.2 Forced Commutation and Various commutation Circuits

1.7 Series and parallel configurations of SCRs

1.8 Working principle of a single phase, full wave, SCR controlled rectifier (explanation using wave shapes) for resistive and inductive loads (concept of free whee1ing diode)

1.9 Relationship for output dc and RMS value, simple problems.

1.10 Applications of SCRs and Triacs such as light intensity control, speed control of dc and universal motors, fan speed regulator, battery charging etc.

1.11 Elementary idea of application of SCR as converter, inverter dc/ac choppers, cycloconvertors

2. Introduction to Integrated circuits Operational Amplifiers and their Applications: (25%)

2.1 Principle of differential amplifier, op. amp.

2.2 Brief description of commonly used ICs such as 7806, 7906, 555, 741 and 810 etc

2.3 Explanation of comparators, inverting and non-inverting type amplifiers using OP AMP IC.

3. Introduction to Digital Electronics (25%)

3.1 Number system

3.2 Logic gates and truth tables

3.3 <W> Algebra <W>

3.4 Combinational circuits, half adder full adder encoder, decoder, multipliers, dividers

3.5 Sequential circuits, flip flops, counters, resistors

3.6 A/D and D/A converters.

4. Introduction to Micro Processors: (15%)

4.1 Architecture of 8085, functional description of 8085, elementary idea of I/O ports

4.2 Brief description of microprocessor based control circuits.

EE-541 INDUSTRY/PRACTICE BASED MINOR PROJECT WORK

	L	T	P
Pds/week	-	-	4

RATIONALE:

Miner project work aims at exposing the students to industrial filed practices so as to have an appreciation of size, scale <W> type of oprations; and work culture in the industries,<W> students will be able to comprehend concepts, principles <W> practices taught in the class room and their application solving field/industrial problems.

Depending upon the interests of the student, location of <W> organisation the student may be sent to:

a) Study various operations

b) Study various types of materials being used

c) Learn about various operations/processes

d) Know about various measuring instruments and test equipment <W>

e) Study the plant layout and material handling in an industry<W>

f) Have knowledge about production planning and control in industry

g) Know about various quality control techniques and safer<W> measures adopted

For effective planning and implementation of this practie<W> training, it is suggested that polytechnic should:

a) Identify adequate number of industrial/field orgnistion<W> where students will be sent for practical training.

b) Prepare a weak book, which can be by students <W> guiding students to perform definite task during <W> prectica1 training

c) Identify teachers who supervise the student <W> provide guidance during practical training

This practical training of 3-4 weeks duration will carry <W> the Marks. 50 marks will be given by industrial/field supervisors <W> 50 marks by the teacher supervising this training. The component of evaluation will include the following:

a)	Punctuality and regularity	15%
b)	Initiative in learning new thing.	15%
c)	Relationship with	15%
d)	Industrial training report	55%

FIFTH SEMESTER<W>

Sr NO	Code NO	SUBJECTS	STUDY SCHEM HRS/WEEK				EVALUATIO SCHEME INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS
			L	T	P	CREDIT	THEORY PAPER MAX MARKS	PRACTI-CALS MAX MARKS	THEORY PAPER MAX HRS	MARKS	PRACT-CALS MAX HIS	MARKS	
(1)	ES-122	Introduction <W>Computer	-	-	4	2	-	50	-	-	50	3	100
(2)	EE-531	Electrical Machines-II	3	2	4	5	50	50	100	3	50	3	250
(3)	EE-532	Generation Switchgear and Protection	3	2	4	5	50	50	100	3	50	3	250
(4)	EE-533	Transmission and Distribution of Electrical power	3	2	-	5	55	-	100	3	-	-	150
(5)	EE-534	Installation Commissioning, of Electrical equipment	4	-	-	3	50	-	100	3	-	3	150
(6)	EE-540	Electric Group-I	4	-	-	4	50	-	100	3	-	-	150
(7)	EE-541	Indurstry/ Practice based Minor Project fort	-	-	4	2	-	50	-	-	50	3	100
<W>Students Centred Activities			-	-	1	-	-	-	-	-	-	-	-
		TOTAL	17	6	17	26	250	200	250	500	-	250	1150

I<W> Course <W> with Civil. Mechanical and Automobile Engineering

II. Student centerd activities will include extension lectures, field find, <W>seminars, debates, hobby clubs, libra: studies, awareness regarding ecology and enviroment, conservation of energy; (Petroleam products, electricity <W> social serving ceaps and other co-curricular activities including, games. Advanced plan for each semester and to made.

4 ELECTIVE GROUP -1

(a) Digital Electronics and Microprocessors
(b) Electric Fraction
(c) Instrumentation
(d) Point Electronics (without Practical as Labs are not existing)

SIXTH SEMESTER<W>

<W> NO	NO	SUBJECTS	STUDY SCHEME HRS/WEEK				EVALUATIO SCHEME INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT				TOTAL MARKS (EXAM)
			L	T	P	CREDIT	THEORY PAPER MAX MARKS	PRACTI-CALS MAX MARKS	THEORY PAPER MAX MARKS	HRS	PRACT-CALS MAX MARKS	HRS	
(1)	ES-610	Computer Programming and Application	2	-	4	3	25	25	100	3	50	3	200
(2)	EE-631	Utilisaton of Electrical Energy	4	2	4	5	50	50	100	3	50	3	250
(3)	EE-632	Repair and Mainte Nance of electrical Electrical	4	2	4	5	50	25	100	3	25	3	200
(4)	EE-634	Electric Group-II	4	-	-	3	50	-	100	3	-	-	150
(5)	CW-501	Industrial Management	4	-	-	3	50	-	100	3	-	-	150
(6)	EE-635	Indurstry/ Practice based Major Project Fork	-	-	8	4	50	50	-	-	150	3	100
<W>		Students Centred Activities	-	-	-	2	-	-	-	-	-	-	-
		TOTAL	18	-	22	23	225	150	300	-	275	-	<W>

i Course <W>with Civil. Mechanical and Automobile Engineering

ii Student centerd activities will include extension lectures, field find, seminars, debates, hobby clubs, <W> studies, awareness regarding ecology and enviroment, conservation of energy; (Petroleam products, electricity et social serving <W> and other co-curricular activities including, games. Advanced plan for each semester got to be made.

<W> ELECTIVE GROUP -II

(a) Industrial Electronics and control of Drives
(b) Power system Protection
(c) Control of Electrical Kachises<W>
(d) Energy Management

EE-630 COMPUTER PROGRAMMING AND APPLICATIONS

	L	T	P
Pds/week	2	-	4

RATIONALE

Information technology and computers have great influence on all aspects of our life. All our work places and environment around are being computerized. In order to prepare technicians to work in these environments, it has become essential that students are exposed to computers and their applications along with associated peripherals related to there are of work, Hence the subject.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Computers Applications Overview (10%)

   1.1 Commercial and business data processing applications

   1.2 Engineering computation

   1.3 Idea about factory automation, role of robotics in modern manufacturing and engineering simulation

2. Programming in Basic/GW Basic/ Q Basic (20%)

   2.1 Introduction to programming concepts

   2.2 Print statement

   2.3 Assignment and arithmetic statement

   2.4 Input, read and data statement

   2.5 Program control statements such as GO-TO, FOR-NEXT, IF-THEN

   2.6 Functions

   2.7 Graphics

   2.8 Strings, arrays and structures

3. Information Storage and Retrieval (20%)

   3.1 Need for information storage and retrieval

   3.2 Familiarisation with data-base softwares

3.3 <L>

3.4 <L>

3.5 <L>

3.6 <L> Programming of very simple application.

4. Computer <W> Drafting (10%)

Application of CAD software viz Auto CAD, Drawing of simple circuits Using Auto CAD commands.

5. Typical Application <W>in Problem Solving in Respective Grammar of Engineering <W>

6. Overview to Window <W>

5.1 <w> with Windows use of mouse

5.2 Various window related softwares and their features such as Microsoft word and Excel etc.

PRACTICAL EXERCISES

(1) Familiarisation with PC, connecting and disconnecting key board, monitor and printer, correct method of handing floppies, dicks and mouse.

(2) Exercises involving executing programmes with output, input <w> data statements in basic, creation of patterns use of late space functions.

(3) Exercises involving use of Input, Output, statements and repetition lcops such as If-then-Else For-Next; Go-To; On-Go-To; While-Do; Repeat- Unit etc.

(4) Exercises in rating and executing simple programmes in BASIC.

(5) Loading and running data base passages

(6) To prepare <w> in different sizes and fonts and generation takes <W>crossof: Word and using windows

(7) To prepare tables and crafts in Excel using windows

EE-631 UTILISATION OF ELECTRICAL ENERGY

	L	T	P
Pds/week	4	-	4

RATIONALE

This subject assumes importance in view of the fact that technician has to work in a wide spectrum of activities where in he has to make collections from alternative schemes from technical and economical considerations; i.e. to plan and design using basic principles and handbooks, to select equipment, processes and components in different situations.

The curriculum has been designed keeping the above objectives in view. Besides giving him basic knowledge in the topics concerned, attempts have been made to ensure that the knowledge acquired is applied in various fields as per his job requirements.

To orient the subject matter in the proper direction, visits to industrial establishments are recommended in order to familiarise the students with the new developments in different areas

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Illumination: (25%)

1.1 Nature of light, curve of relative sensitivity of human eve and wave length

1.2 Definition: flux, solid angle, luminous intensity, illumination, luminous efficiency, depreciation factor, coefficient of utilisation, space to height ratio, reflection factor, laws of illumination

1.3 Calculation of number of light points for interior illumination; Calculation of illumination at different points; considerations, involved in simple design-problems and illumination schemes; indoor and outdoor i11uminalion level

1.4 Different sources of light: Difference in Incandescent and discharge lamps their construction and characteristics, fittings required for filament lamp, mercury lamp, fluorescent lamp, sodium lamp, neon lamp, halogen lamps, compact fluorescent lamp

1.5 Main requirements of proper lighting; absence of glare, contrast and shadow

1.6 Principles of street lighting

2. Electric Heating (20%)

2.1 Introduction

2.2 Advantages of e1ectrical heating

2.3 Heating methods;

2.3.1 Resistance hunting (direct resistance heating, indirect resistance heating, electric ovens, their temperature range) properties of heating elements, domestic water heaters and other heating appliances
2.3.2 Induction heating; principle; core type and coreless induction furnace
2.3.3 Electric are heating; direct and indirect are heating; are furnace
2.3.4 Dielectric heating, Applications in various industrial fields

2.4 Simple design problems of Resistance heating element

3. Electric Welding: (10%)

3.1 Welding methods, Principles of resistance welding, welding equipment

3.2 Principle of are production, electric are welding principle, characteristics of arc; carbon and metallic arc welding, power supply, advantage of coated electrode, comparison of AC and DC arc welding; welding control and welding control circuits

4. Electrochemica1 Processes: (10%)

4.1 Need of electro-deposition

4.2 Application of Faraday's laws in electro-deposition

4.3 Objectives of electroplating

4.5 Factors governing electro deposition;

4.6 Equipments and accessories for electroplating plant

4.7 Principle of anodising and its applications

4.8 Electroplating on non-conducting materials

5 Electrical Circuits used in Refrigeration and Air Conditioning and Water Coolers: (10%)

5.1 <L> refrigeration cycle

5.2 Description of Electrical circuit used in

a) refrigerator.

b) airconditioner, and

c) water coo1er

6. Electric Drives: (15%)

6.1 Advantages of electric drives

6.2 Characteristics of different mechanical loads

6.3 Types of motors used in electric drive

6.4 Electric braking:

a) Plugging

b) Rheostatic Breaking

c) Regenerative Braking

6.5 Methods of power transfer by devices like belt drive, gears, pulley

6.6 Examples of selection of motors for particular loads

6.7 Applications such as general workshop, textile mill, paper mill, steel mill, printing press, crane and lift

6.8 Applications of commonly used motors (squirrel cage induction motors, slip ring induction motors, AC series motors)

7. Electric Traction: (10%)

7.1 Advantages of electric traction

7.2 Different systems of electric traction, DC and AC system

7.3 Different accessories for track electrification; such as overhead wires, conductor rail system, current collector-pentagraph

7.4 Electrical block diagram of an electric locomotive with description of various equipments and accessories

7.5 Breaking of traction motors

LIST OF PRACTICALS

1. Study of different types of sources of light and make connections, and to measure intensity of light with lux meter :

   1.1 Fluorescent lamp

   1.2 HP mercury vapour lamp

   1.3 HP sodium vapour lamp

   1.4 Compact Fluorescent lamp (CFL)

2. Study of induction furnace by visiting a factory and to prepare a report

   Study of welding equipment and its accessories

4. Study of the electroplating plant by visiting an industry and preparing a report

5. Study of refrigerator/air conditioner and to prepare a report of its electrical circuit

6. To electroplate a given piece of material

7. To draw load current vs terminal voltage characteristics of a welding transformer with water rheostat load

EE-632. REPAIR AND MAINTENANCE OF ELECTRICAL EQUIPMENT (Excluding Installation and Commissioning)

	L	T	P
Pds/week	4	-	4

RATIONALE

Many of the electrical technicians employed in State Electricity Boards or other electrical industries are engaged in installation, maintenanace and repair of a variety of electrical equipment. Such areas may include generation, transmission and distribution systems, different types of electrical drives used with a variety of mechanical gadgets. Normally manufacturers of heavy electrical equipment provide service manuals, instructions for installation, maintenance and fault location. Indian Electricity Rules and Indian Standard specification also provide enough guidelines. This syllabus has been designed to provide certain guidelines and broad principles regarding the above activities. Appropriate field trips will reinforce the learning.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Knowledge of Indian Electricity rules, safety codes and requirements, causes and prevention of accidents, procedure on occurrence of accidents, first aid. artificial respiration, resuscitation drill, invenstigation and management of accidents, workmen's safety devices and periodical inspection of safety devices. (10%)

2. Maintenance concepts, types of maintenance, maintenance schedules, maintenance management, history cards and job cards (10%)

3. Transmission and Distribution System (20%)

   Authorised persons, danger notice, caution notice, to work, arranging of shutdowns personally and telephonically foreign voltages and lines in the vicinity, location of local/temporary eraths cancellation of permit and restoration of supply.

   Patrolling and inspection of lines -partrol books and line maintenance registers, frequency and schedule of patrolling points to be noted during patrolling from ground; special inspections; night inspections; emergency inspections support - head inspections; measurement of clearance of <w><L> of a underground cable faults and <w> the same.

Open or loose neutral connections and non provision of fuses on service<W> lines and their effect on system <W>dim and <W> lights.

4. Distribution Transformers (20%)

Transformers, maintenance register schedule of maintenance, point to be attended to in respect of various items of equipment such as distribution transformer. LT switch, lightning arrestors, insulators, cross arms, gang operating switch, conductors/earth wire, guys, earthing, foundations etc.

Checking of insulation resistance, transformer oil level and BDV test of oil Measurement of earth resistance

Balancing of phases, dangerous situations due to higher earth resistance, improvement of earth resistance value, grounded neutral.

5. Grid Substations (10%)

Checking and maintenance of busbars, isolating switching, voltage and current transformers, lighting arrestors, control and relay panels, shunt capacitors, IIT/IT circuit breakers, LT switches, power transformers and their dehydration, oil tests, earthing system, batteries and other auxiliaries.

6. Motor (10%)

Over haunting of motors, preventive maintenance, trouble shooting of electric motors, maintenance schedules of motors, repair/maintenance of motor control/power control centres.

7. Domestic Installation (10%)

Introduction, testing of electrical installation of a building, testing of insulation resistance to earth, testing of insulation and resistance between conductors continuity of open circuit test, short circuit test, testing of earthing continuity, polarity test, localization of faults IF rules for domestic installation

8. Batteries (10%)

Construction, working and application of head acid battery, alkaline (Ni-Fe and Ni-Cd) batteries, maintenance of lead acid battery, alkaline Battery and Nickel Cadium battery, methods of charging, specifications of Battery, factors affecting battery life.

NOTE: <L>

LIST OF PRACTTCALS

1. Study and handing of tools and accessories for <w> heavy equipment
2. Testing of Electrical equipment before commissioning
3. Study of commission of Electrical equipments
4. Testing of industrial wiring
5. Measurement of earth resistance
6. Dismantling assemb1ing and overhauling of electrical machines/gadgets
7. Testing and Maintenance of Batteries
8. Battery charging by constant current on instant voltage method
9. Repair and maintenance of domestic electrical app1iances e.g. electric iron, geyser, fan, heat convector, washing machine, room cooler etc.
10. Connections of single phase and 3 -phase motors through an appropriate starter and to change their direction of rotation.

EE-634 ELECTIVE-II

	L	T	P
Pds/week	4	-	-

Student may choose one of the subjects given below as <w>

(a) Industrial Electronics and Control <w>

(b) Power System Protection

(c) Control of Electrical Machines

(d) Energy Management

For detailed contents of each of Elective Subjects Please refer the following pages.

<W> INDUSTRIAL ELECTRON'ICS AND CONTROL OF DRIVES

	L	T	P
Pds/week	4	-	-

RATIONALE

In modern industries all processes/drives are electronically controlled as the electronic controls are more efficient effective and accurate. The electrical diploma holders will be maintaining, control panels used in processes and drives. Therefore, the know1edge of basic power control divices, SCRs and app1ication of electronics in welding and e1ectric heating will be necessary. Hence this subject.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Basic Power control devices and circuits: (15%)

   a) Review of SCR, DIAC. TRIAC. UJT

   b) Selection of the heat sinks for SCRS

   c) Triggering processes (Resistance and RC) and triggering circuits for SCRs

   d) Turn off (commutation) processes (natural and forced and circuits for SCRs

2. Phase Controlled Rectifiers: (20%)

   Various types of phase controlled rectifiers using SCRs for resistive and inductive load. Phase control using triac. Application of phase controlled rectifiers in illumination control, temperature control, level control etc.

3. Inverters, Choppers. Dual Converters. Cycloconverters (20%)

   Concept of inverters, naturally commutated inverters, Basic series and parallel capacitor commutated inverters. Basic principle of operation of chopper circuits, dual converters, cycloconverters for 1-phase and 3-phase 1oads.

4. Power E1ectronics Application in, Control of Drives: (20%)

   Principles of various methods of

   i) obtaining variable speed in dc motors

   ii) Four quadrant operation of AC motors using configurations

iii) 16 2/3 Hz and 25 Hz cyclo-converter circuits.

Principle of dual converters and their applications.

5. Solid State Control of Industrial Processes (25%)

5.1 Electric Heating:

Industrial heating – skin effect, depth of current penetration, power requirement, applications of indirect heating, dielectric heating and its application, electronic control circuit for electric heating.

5.2 Resistance Welding:

Electronic welding control, synchronous control circuits, energy storage welding system, pulsating welding

5.3 Illumination Control

Illumination control using various thyristors devices

5.4 Refrigeration and Air-Conditioning

Thyristrised control of refrigeration and air-conditioning Plants.

EE-634 (b) POWER SYSTEM PROTECTION

	L	T	P
Pds/week	4	-	-

RATIONALE

Electrical Diploma holders when employed in State Electricity Department/Board are engaged in generation, transmission and distribution of electrical power. Before commissioning of any equipment testing is done to protect from various hazards. Protection in itself is specialised field in electrical engineering. This subject will include protective devices such as relays, circuit breakers and various methods of protection. This will form a base and understanding of various measures adopted in protecting electrical equipment.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Types of faults in power system; calculation of short circuit current in symmetrical faults; Reactors - types. Location (10%)

2. Protective Relaying: (25%)

   Classification, operating principle of induction type relays, electromagnetic relays, thermal relays, distance relay, differential relays, directional and reverse power relay, over voltage relay, under voltage relays; static relays bone principles and their application, transistor as a switch, time delay circuits, level detectors, logic circuits, realisation of definite time overcurrent relay. Inverse time current relay circuit; fuses; types and. their applications

3. Circuit Breakers: (20%)

   Types, arc interruption theories, oil circuit breakers, air blast circuit breakers, vacuum circuit breaker and SF_6

   circuit breakers, their comparative study and application; DC circuit breakers, rating of circuit breakers

4. Generator Protection: (15%)

   Starter faults, rotor faults, abnormal running conditions and their protection, rotor protection; stator differential protection, earth fault protection

5. transformer Protection: (15%)

   <L>
   <L>

6. Feeder and Bus Bar Protection: (10%)

Differential protection of parallel feeders, ring main protection, <w> price protection scheme. Frame <w> protection, differential protection of bus bars

7. Lightening Arrestors: (5%)

<W> Types, working principle and their applications

<W> CONTROL OF ELECTRICAL MACHINES

	L	T	P
Pds/week	4	-	-

RATIONALE

A diploma holder in industry is called upon to design and modify electrical control circuits. He is also required to carry out trouble shooting in control circuits. To achieve these skills it is necessary that he should be well conversant with various types of motors starters and control systems used in industry. Knowledge of static control of machines using, Digital logic gates and Programmable control of machines is also necessary as these are increasingly being in industry today.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Control Components: (15%)

   Fuses, switches and fuse switch units, moulded case and miniature circuit breakers, contactors, contactor ratings, different types of relays, latching relay, frequency responsive relays, Bimetallic Ratchet and Magnetic type overload relay's. Thermal, Pneumatic and electronic timers, phase failure relay, push button switches, drums switches, limit switches, speed actuating switches, solenoid valves, pressure switches, temperature switches, float switches, control transformer, symbols for various components, control diagrams

2. Starters for 3 Phase squirrel Cage Induction 'Motors: (10%)

   Introduction. motor current at star; and during acceleration. Manual and automatic primary resistor, increment resistor, line reactor and auto-transformer starters. Closed circuit transition auto-transformer starter, star-delta starter (open circuit and closed circuit transition). Part winding two step and three stepmotor starters. Two speed two winding and one winding motor starters. Forward/reverse starter, plug stopping of motors. Dynamic braking

3. Starters for Wound rotor Induction Motors (15%)

   Introduction, motor acceleration, manual starter using master controllers, definite time limit starters using
   <L>
   <L>
   <L>

4. Control of Single Phase Motors (15%)

Reversing and speed control of universal motors, <w> for two value capacitor type split phase motor. Starter for a two value capacitor motor using a current relay and an auto transformer, dynamic braking of split phase motor, plug reversing of capacitor start motors, speed control of split phase and permanent split capacitor motors.

5. Control of Synchronous Motors (10%)

Manual push button synchronizing starter. Timed semi- automatic synchronising. Automatic starter using polarized field frequency relay.

6. Protection of Motors (5%)

Co-ordination of fuse, over load and contractor/circuit breaker characteristics. Overload and short circuit protection, over temperature protection, under voltage protection, phase failure and phase reversal protection.

7. Industrial Control Circuits (5%)

Introduction, planar machine, skip hoist, automatic control for a water pump, lifting magnets, control of electrical ovens, overhead crane, battery trolley, battery operated truck, air compressor, walking beam, conveyer system, elevator, trouble shooting in control circuits.

8. Static Control of Machines (15%)

Advantages and disadvantages of static control compared to magnetic control. Explanation of different logic gates, memory elements, RS flip flop, JK flip flop, retentive memory elements. Developments of logic circuits, input devices for solid state logic like capacitive switch filter, bounce eliminatory, single converters. Output devices for solid static logic. Study of some industrial circuits like:

i) Control of solenoid valve operated cylinder piston assembly.
ii) Control of three stage air conditioning system
iii) Speed control of wound rotor induction motor.
iv) Control of planar machine
v) Control of these conveyers

9. Introduction to Programmable Controllers (10%)

Parts of a programmable controller, inputs/output section, central processing unit, input image table, output image table, user program memory, variable data memory, complete<w> cycle the programming terminates, program entry.

<L>

EE 634 (d) ENERGY MANAGEMENT

	L	T	P
Pds/week	4	-	-

RATIONALE

In the context of continuing power shortage in the country, it is emphasised by one and all to conserve the available energy. Energy management is thus a very important area second only to safety. Electrical diploma holders have to make use of electrical energy in one form or the other. This implies that an electrical diploma holder must know the efficient use of electrical energy. Energy Management procedure will, therefore, enable these diploma technicians to plan their operation and production activities such that energy is properly utilised and bills are optimised. This course <W> management will deal with energy conservation techniques, energing auditing, non-conventional energy sources, core generation and efficient energy utilisation techniques.

NOTE: Weightage of each topic for external examination is given in the brackets

DETAILED CONTENTS

1. Energy Resources (10%)

   World energy resources and energy consumption pattern: Indian energy scenario, energy intensive processes in industries e. g. electroplating, steel making, aluminium making, fertilisers etc

2. Energy Utilisation and Conversion System (10%)

   Furnaces and their fuels, Heat recovery, Reduction of losses. Compressed air, energy efficiency. Hydraulic power system and steam turbines. Combined heat and power systems

3. Electric Circuits Devices and Systems (20%)

   Electric circuit theory, power racier, high and low power factor loads, electrical measurements and measuring instruments, efficient lighting, motive (driving) power and power factor improvement, optimum start and speed control of drives

4. Energy Auditing (20%)

   Concept and types of energy auditing Preparation of energy balance sheets, identification of loss processes in devices <L>

5. Energy Efficient Technology (15%)

Efficient lighting, sector-wise energy conservation strategies, machine maintenance and tribological approach efficient transmission and distribution of electric energy.

6. Waste Heat Recovery and Combined Heat and Power (15%)

Source of waste energy, heat exchangers and their comparative study, regenerators and recuperators, waste heat boilers, thermal storage and transport. Low energy buildings and air conditioning.

7. Energy Economics and Decision Making (10%)

Cost benefit analysis, decision making, linear programming and system dynamics, energy pricing, penalties and sub-sidies

CM-501 INDUSTRIAL MANAGEMENT

	L	T	P
Pds/week	4	-	-

RATIONALE

The knowledge of this subject is required for all engineers/technicians who wish to choose industry/field as their career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about safety and labour, industrial and tax laws.

NOTE : Weightage of each topic for external examination is given in the brackets.

DETAILED CONTENTS

1. Principles of Management (5%)

1.1 Management, different functions of management: planning, organizing, coordinating and controlling.

1.2 Structure of an industrial organization

1.3 Functions of different departments

1.4 Relationship between individual departments

2. Human and Industrial Relations (10%)

2.1 Human relations and performance in organization

2.2 Understand self and others for effective behaviour

2.3 Behaviour modification techniques

2.4 Industrial relations and disputes

2.5 Relations with subordinates, peers and superiors

2.6 Characteristics of group behaviour and trade unionism

2.7 Mob psychology

2.8 Grievance, Handling of grievances

2.9 Agitations, strikes, Lockouts, Picketing and Gherao

2.10 <L>

2.11 Workers participation in management.

3. Professional ethics (5%)

   3.1 Concept of ethics

   3.2 Concept of professionalisms

   3.3 Need for professional ethics

   3.4 Code of professional ethics

   3.5 Typical problems of professional engineers

   3.6 Professional bodies and their role

4. Motivation (10%)

   4.1 Factors determining motivation

   4.2 Characteristics of motivation

   4.3 Methods for improving motivation

   4.5 Job satisfaction and job enrichment

5. Leadership (10%)

   5.1 Need for leadership

   5.2 Functions of a leader

   5.3 Factors to be considered for accomplishing effective leadership

   5.4 Manager as a leader

6. Standard and Codes (5%)

   6.1 National and International Codes

   6.2 ISO 9000 – concept, its evaluation and implications

   6.3 Concept of Total Quality Management (TQM)

7. Human Resource Development (10%)

   7.1 Introduction

   7.2 Staff development and career development

   7.3 Training strategies and methods

8. Wage Payment (5%)

8.1 Introduction to wages

8.2 Classification of wage payment scheme

9. Labour, Industrial and Tax Laws. (10%)

9.1 Importance and necessity of industrial legislation

9.2 Types of labour laws and disputes

9.3 Brief description of the following Acts:

The Factory Act 1948; Payment of Wages Act 1936; Minimum Wages Act 1948, Workmen's Compensation Act,1923; Industrial Dispute Act, <w>, Employees' State Insurance Act, 1948; Provident Fund Act.

9.4 Various types of Taxes – Production Tax, Local Tax, Sales Tax, Excise Duty, Income Tax.

9.5 Labour Welfare Schemes

10. Accidents and Safety (10%)

10.1 Classification of Accidents:

- According to nature of injuries: fatal: temporary
- According to event
- According to place

10.2 Causes of accidents – psychological, physiological, physiological and other industrial hazards.

10.3 Effects of accidents

10.4 Accidents – prone workers.

10.5 Action to be taken in case of accidents with machines, electric shock, road-accident, fires and erection and construction accidents.

10.6 Safety consciousness

10.7 Safety procedures

10.8 Safety measures – Do's and don'ts.

10.9 Safety publicity.

10.10 Safety measures during executions of engineering works

11 Environmental Engineering (10%)

11.1 Ecology

11.2 Factors causing pollution

11.3 Effects of pollution on Human health

11.4 Air pollution and control act

11.5 Water pollution and control act

11.6 Pollution control equipment

11.7 Solid waste management

11.8 Noise pollution and its control

12. Entrepreneurship Development (10%)

12.1 Concept of entrepreneurship

12.2 Need of entrepreneurship in context of prevailing employment conditions of the country

12.3 Successful entrepreneurship

12.4 Preparation of project report

12.5 Training for entrepreneurship development.

Note:

* An expert from industry/institute may be invited to deliver lecture.