

Faculty of Engineering and Technology
P.K.University
Shivpuri (MP)



Evaluation Scheme & Syllabus
Diploma in Electrical Engineering
I Year- I& II Semester
(Effective from session 2019-20)

ELECTRICAL ENGINEERING

I - SEMESTER		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DEE-101	Foundation Communication	30	70	25	25	150
DEE-102	Applied Mathematics-I	30	70	NA	NA	100
DEE-103	Applied Physics	30	70	25	25	150
DEE-104	Applied Chemistry	30	70	25	25	150
DEE-105	Electrical & Electronics Engineering Material	30	70	NA	NA	100
II - SEMESTER		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DEE-201	Applied Mathematics-II	30	70	NA	NA	100
DEE-202	Applied Physics-II	30	70	25	25	150
DEE-203	Basic Electrical Engineering	30	70	25	25	150
DEE-204	Electronics - I	30	70	25	25	150
DEE-205	Engineering Drawing	30	70	NA	NA	100
III - SEMESTER		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DEE-301	Functional Communication	30	70	25	25	150
DEE-302	Applied Mathematics-III	30	70	NA	NA	100
DEE-303	E.I.M.	30	70	25	25	150
DEE-304	Elementary Mech. & Civil Engg.	30	70	25	25	150
DEE-305	Electrical Machine-I	30	70	25	25	150
DME-306	Computer Application- Practical	NA	NA	25	25	50

IV - SEMESTER		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DEE-401	Electronics-II	30	70	25	25	150
DEE-402	Electrical Design, Drawing and Estimating-I	30	70	25	25	150
DEE-403	Power Plant Engg.	30	70	NA	NA	100
DEE-404	Trans. & Distribution of Electrical Power	30	70	NA	NA	100
V - SEMESTER		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DEE-501	Industrial Management &Ent. Dev.	30	70	NA	NA	100
DEE-502	Switch Gear & Protection	30	70	NA	NA	100
DEE-503	Industrial Electronics & Control	30	70	25	25	150
DEE-504	Electrical Machine-II	30	70	25	25	150
DEE-505	Electrical Traction	30	70	NA	NA	100
DEE-506	Integrative comm.- Practical	NA	NA	25	25	50
VI - SEMESTER		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DEE-601	Environmental Education & Disaster Mgmt.	30	70	NA	NA	100
DEE-602	Installation, Maintenance & Repair of Elect. Machines	30	70	NA	NA	100
DEE-603	Electrical Design, Drawing & Estimating II	30	70	NA	NA	100
DEE-604	Utilization of Elect. Energy	30	70	NA	NA	100
DEE-605	Project	NA	NA	25	25	50

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I Year I Semester

DEE-101: FOUNDATIONAL COMMUNICATION

SECTION "A" (ENGLISH)

1. PARTS OF SPEECH:

- a. Noun
- b. The pronoun: Kinds and Usage
- c. The adjective: Kinds and Degree
- d. Determiner: Articles
- e. The verb: Kinds
- f. The Adverb: Kinds, Degree and Usage
- g. Prepositions
- h. Conjunctions
- i. The Interjections
- j. Subject: Verb Agreement (Concord)

2. VOCABULARY BUILDING :

- a. Antonyms and Synonyms
- b. Homophones
- c. One word substitutions
- d. Idioms and Phrases
- e. Abbreviations

3. GRAMMAR

- a. Sentence & its types
- a. Tenses
- b. Punctuations
- c. Active and Passive voice
- d. Transformation of Sentences
- e. Synthesis of Sentences
- f. Direct and Indirect Narrations

4. DEVELOPMENT OF EXPRESSION (Composition) :

- a. Paragraph Writing
- b. Essay Writing
- c. Proposal Writing
- d. Letter Writing (Formal, Informal, Business, official etc.)
- f. Report Writing
- g. Note Making
- h. News Making
- i. Application Writing
- j. Minute Writing
- k. Invitation Letter Writing

SECTION "B" (Hindi)

- 5— संज्ञा, सर्वनाम, विशेषण, क्रियाविषेण, वर्णसमास, संधि, अलंकार, रस, उपसर्ग प्रत्यय।
6— पत्र लेखन, निविदासंविदा, दरआमंत्रण (कोटेशन)अपील, स्वतन्त्र अभिव्यक्ति, प्रतिवेदनलेखन, प्रेसविज्ञप्ति।
7— वाक्य/वाक्यांश के लिए शब्द, पर्यायवाची या समानार्थी शब्द, विलोम शब्द, अनेकार्थी शब्द, शब्दयुग्म या समुच्चारित शब्दसमूह, वाक्य शुद्धि (शुद्ध अशुद्ध वाक्य), मुहावरे एवं लोकोक्तियाँ।

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I Year I Semester

DEE-102: APPLIED MATHEMATICS I

1. ALGEBRA-I:

- 1.1 Series : AP and GP; Sum, nth term, Mean
1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.
1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Cramer's rule

2. ALGEBRA-II:

- 2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.
2.2 Complex number : Complex numbers, Representation, Modulus and amplitude Demoivre theorem, its application in solving algebraic equations, Mod. function and its properties..

3. TRIGONOMETRY :

- 3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relationship between sides and angle of a triangle.
3.2 Inverse circular functions : Simple case only

4. DIFFERENTIAL CALCULUS - I:

- 4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.
4.2 Methods of finding derivative, - Function of a function, Logarithmic differentiation, Differentiation of implicit functions.

5. DIFFERENTIAL CALCULUS -II :

- 5.1 Higher order derivatives, Leibnitz theorem.
5.2 Special functions (Exponential, Logarithmic, Inverse circular and function), Definition, Graphs, range and Domain and Derivations of each of these functions.
5.3 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

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I Year I Semester

DEE-103: APPLIED PHYSICS-I

1. UNITS AND DIMENSIONS (4 MARKS)

S.I. Units & Dimensions of physical quantities, Dimensional formula and dimensional equation. Principle of homogeneity of dimensions and applications of homogeneity principle to: (i) Checking the correctness of physical equations, (ii) Deriving relations among various physical quantities, (iii) Conversion of numerical values of physical quantities From one system of units into another. Limitations of dimensional analysis.

2. ERRORS AND MEASUREMENT (4 Marks)

Errors in measurements, accuracy and precision, random and systematic errors, estimation of probable errors in the results of measurement (Combination of errors in addition, subtraction, multiplication and powers). Significant figures, and order of accuracy in respect to instruments,

3. CIRCULAR MOTION (5 MARKS)

Central forces. Uniform Circular motion (Horizontal and Vertical cases), angular velocity, angular acceleration and centripetal acceleration. Relationship between linear and angular velocity and acceleration. Centripetal and centrifugal forces. Practical applications of centripetal forces. Principle of centrifuge.

4. MOTION OF PLANETS AND SATELLITES :(5 Marks)

Gravitational force, Acceleration due to gravity and its variation w.r. to height and depth from earth, Kepler's Law, Escape and orbital velocity, Time period of satellite, Geo-stationary, Polar satellites.

5. DYNAMICS OF RIGID BODY (ROTATIONAL MOTION) (6 MARKS)

Rigid body, Rotational motion, Moment of inertia, Theorems (Perpendicular and Parallel axis) of moment of inertia (Statement). Expression of M.I. of regular bodies (Lamina, Sphere, Disc, Cylindrical), Concept of Radius of gyration, angular momentum, Conservation of angular momentum, Torque, Rotational kinetic energy. Rolling of sphere on the slant plane. Concept of Fly wheel.

6. FLUID MECHANICS :(5 MARKS)

Surface tension, Capillary action and determination of surface tension from capillary rise method, Equation of continuity ($A_1V_1=A_2V_2$), Bernoulli's theorem, and its application stream line and Turbulent flow, Reynold's number.

7. FRICTION :(4 MARKS)

Introduction, Physical significance of friction, Advantage and disadvantage of friction and its role in every day life. Coefficients of static and dynamic friction and their measurements. viscosity, coeff. of viscosity, & its determination by stoke's method.

8. HARMONIC MOTION (6 MARKS)

Periodic Motion ,characteristics of simple harmonic motion; equation of S.H.M. and determination of velocity and acceleration. Graphical representation. Spring-mass system. Simple pendulum. Derivation of its periodic time. Energy conservation in S.H.M.. Concept of phase, phase difference, Definition of free, forced, undamped and damped vibrations, Resonance and its sharpness, Q-factor.

9. HEAT & THERMODYNAMICS: (6 MARKS)

Modes of heat transfer (Conduction, Convection and Radiation), coefficient of thermal conductivity Isothermal and adiabatic process. Zeroth First, Second Law of Thermodynamics and Carnot cycle, Heat Engine (Concept Only).

10. ACOUSTICS (5 MARKS)

Definition of pitch, loudness, quality and intensity of sound waves. Echo, reverberation and reverberation time. Sabine's formula without Derivation. Control of reverberation time (problems on reverberation time). Acoustics of building defects and remedy.

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I Year I Semester

DEE-104:APPLIED CHEMISTRY

1. ATOMIC STRUCTURE :

Basic concept of atomic structure, Matter wave concept, Quantum number, Haisenberg's Uncertainty Principle, Shaples of orbitals.

2. CHEMICAL BONDING :

Covalent bond, Ionic & Co-ordinate, Hydrogen bonding, Valence bond theory, Hybridisation, VSEPR theory, Molecular orbital theory.

3. CLASSIFICATION OF ELEMENTS :

Modern classification of elements (s,p,d and f blcok elements), Periodic properties : Ionisation potential electro negativity, Electron affinity.

4. ELECTRO CHEMISTRY-I:

Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases : Bronsted, Arrhenius and Lewis theory. Concept of pH and numericals. Buffer solutions, Indicators, Solubility product, Common ion effect with their application,

5. ELECTRO CHEMISTRY-II:

Redox reactions, Electrode potential(Nernst Equation), Electro-chemical cell (Galvanic and Electrolytic). EMFof a cell and free energy change. Standard electrode potential, Electro chemical series and its application. Chemical and Electrochemical theory of corrosion, Galvenic Series. Prevention of corrosion by various method.

6. CHEMICAL KINETICS :

Law of mass action, order and molecularity of rection. Activation energy, rate constants, Ist order reactions and 2nd order reactions.

7. CATALYSIS :

Definition Characteristics of catalytic reactions, Catalytic promotors and poison , Autocatalysis and Negative catalysis, Theory of catalysis, Application.

8. SOLID STATE :

Types of solids (Amorphous and Crystalline), Classification (Molecular, Ionic, Covalent, Metallic), Band theory of solids (Conductors, Semiconductors and Insulators), types of Crystals, FCC, BCC, Crystal imperfection.

9. **FUELS :**

Definition, its classification, high & low Calorific value. Determination of calorific value of solid and liquid fuels by Bomb calorimeter.

Liquid fuel - Petroleum and its refining, distillate of petroleum (Kerosene oil, Diesel and Petrol), Benzol and Power alcohol. Knocking, Anti-knocking agents, Octane number and Cetane number.

Cracking and its type, Gasoling from hydrogenation of coal (Bergius process and Fischer tropsch's process)

Gaseous Fuel - Coal gas, Oil gas, Water gas, Producer gas, Bio gas, LPG and CNG. Numerical Problems based on topics.

10. **WATER TREATMENT :**

Hardness of water, Its limits and determination of hardness of water by EDTA method. Softening methods (Only Sods lime, Zeolote and Ion exchange resin process). Disadvantage of hard water in different industries, scale and sludge formation, Corrosion, Caustic embrittlement, primming and foarming in biolers.

Disinfecting of Water By Chloramine-T, Ozone and Chlorine. Advantage and disadvantage of chlorinational, Industrial waste and sewage, Municipality waste water treatment, Definition of BOD and COD. Numerical Problems based on topics.

11. **COLLOIDAL STATE OF MATTER :**

Concept of collidal and its types, Different system of colloids, Dispersed phase and dispersion medium. Methods of preparation of colloidal solutions, Dialysis and electro dialysis. Properties of colloidal solution with special reference to absorption, Brownian Movement, tyndal effect, Electro phoresis and coagulation. relative stability of hydrophillic and hydrophobie colloids. Protection and protective colloids. Emulsion, Types, preparation, properties and uses. Application of colloids chemistry in different industries.

12. **LUBRICANTS :**

Definition, classification, Necessasity and various kinds of lubricants. Function and mechanism of action of lubricants and examples. Properties of lubricants, Importance of additive compunds in lubricants, Synthetic lubricants and cutting fluids. Industrial application, its function in bearing.

13. **HYDROCARBONS:**

A. Classification and IUPAC nomenclature of organic compounds homologous series (Functional Group)

B. Preparation, properties and uses of Ethane, Ethene, Ethyne (Acetylene), Benzene and Toluene.

14. **ORGANIC REACTIONS & MECHANISM:**

1. Fundamental aspects -

A. Electrophiles and nucleophiles, Reaction Intermediates, Free radical, Carbocation, Carbanion

B. Inductive effect, Mesomeric effect, Electromeric effect.

2. A. Mechanism of addition reaction (Markonicove's Rule, Cyanohydrin and Peroxide effect),

B. Mechanism of Substitution reactions; (Nucleophilic) hydrolysis of alkyl halide, electrophilic substitution halogenation, Sulphonation, Nitration and Friedel-Craft reaction.

C. Mechanism of Elimination reaction - Dehydration of primary alcohol, Dehydrohalogenation of primary alkyl halide.

15. **POLYMERS :**

1. Polymers and their classification. Average degree of polymerisation, Average molecular weight, Free radical polymerisation (Mechanisms)

2. Thermosetting and Thermoplastic resins -

A. Addition polymers and their industrial application- Polystyrene, PVA, PVC, PAN, PMMA, Buna-S, Buna-N, Teflon.

B. Condensation polymer and their industrial application :

Nylon 6, Nylon 6,6, Bakelite, Melamine formaldehyde, Urea formaldehyde, Terylene or Decron, Polyurethanes.

3. General concept of Bio polymers, Biodegradable polymers and inorganic polymers(Silicon)

16. **SYNTHETIC MATERIALS :**

A. Introduction - Fats and Oils

B. Saponification of fats and oils, Manufacturing of soap.

C. Synthetic detergents, types of detergents and its manufacturing.

3. EXPLOSIVES: TNT, RDX, Dynamite.

4. Paint and Varnish

LIST OF PRACTICAL'S

1. To analyse inorganic mixture for two acid and basic radicals from following radicals

A. Basic Radicals : NH_4^+ , Pb^{++} , Cu^{++} , Bi^{+++} , Cd^{++} , As^{+++} , Sb^{+++} , Sn^{++} , Al^{+++} , Fe^{+++} , Cr^{+++} , Mn^{++} , Zn^{++} , Co^{++} , Ni^{++} , Ba^{++} , Sr^{++} , Ca^{++} , Mg^{++}

B. Acid Radicals : CO_3^{--} , S^{--} , SO_3^{--} , CH_3COO^- , NO_2^- , NO_3^- , Cl^- , Br^- , I^- , SO_4^{--}

2. To determine the percentage of available Chlorine in the supplied sample of Bleaching powder.

3. To determine the total hardness of water sample in terms of CaCO_3 by EDTA titration method using Eriochroma black-T indicator.

4. To determine the strength of given HCl solution by titration against NaOH solution using Phenolphthalein as indicator.

5. To determine the Chloride content in supplied water sample by using Mohr's methods.

6. Determination of temporary hardness of water sample by O-Henry's method.

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I Year I Semester

DEE-105 ELECTRICAL AND ELECTRONICS ENGG. MATERIALS

1. Classification

Classification of materials into conducting, Semiconducting and insulating materials with reference to their atomic structure.

2. Conducting Materials

- (i) Resistivity and factors affecting resistivity, such as temperature, alloying and electrical stressing
- (ii) Super conductivity and super conducting material.
- (iii) Low resistivity materials e.g. Copper, aluminum and steel, their general Properties as conductor e.g. resistivity, temperature co-efficient, mechanical Properties, corrosion, solar ability, contact resistance and practical application Uses of mercury as conducting material.
- (iv) Comparison of copper, aluminums and steel forvarious applications as electrical conductor.
- (v) Low resistivity copper alloys: brass, bronze (cadmium and beryllium), their Practical application.
- (vi) High resistivity materials: managng, constantan nichrome, carbon, tungsten, their practical applications.
- (vii) Electric lamp materials.
- (viii) Brush contact materials.
- (ix) Soldering materials.
- (x) Thermocouple materials, Fuse materials.

3. Insulating Materials

- (i) Introduction.
- (ii) Properties of insulating material.
 - **Electrical properties:** Volume resistivity, Surface resistivity, Dielectric Loss, Dielectric Contant, Dielectric strength.
 - **Mechanical properties:-** Mechanical strength
 - **Physical properties :-** Hygrscoopcity tensile and compressive strength, Abrasive resistance brittleness.
 - **Thermal properties -** Heat resistance, Classification according to high permissible temperature rise, Effect of over loading on the life of an electrical appliances, Increase in rating with the use of insulating materials having higher thermal stability, Thermal conductivity.
 - **Chemical properties-** Solubility, Chemical resistance, Weather ability
- (iii) Insulating materials and their application-
 - Definition and classification
 - Thermo setting materials e.g. Phenol Formaldehyde, Resins (i.e Bakelite), Amino resins

(Ureca Formaldehyde and Melamine formaldehyde), Epoxy resins their properties, Applications and Commercial names.

- Thermo Plastic materials e.g. Polyvinyl Chloride(P.V.C.), Poly Ethelene Silicons their Properties application and commercial names. Brief description of extrusion and moulding process of using plastic materials in electrical engineering
- Natural Insulating Materials- Mica and Mica products, Asbestos and Asbestos products, Ceramic materials (Porcelain and Stealite), Glass and glass products, Cotton, Silk, Jute, Paper (Dry and impregnated), Rubber Butuman, Mineral and insulating oil for transformer, switch gear, capacitors, high voltage cables, insulating varnishes for coating and impregnation, Enamels for winding wires, Glass fibre sleeves
- Gasous Materials e.g. Air, Hydrogen, Nitrogen and SF6

4. Magnetic Materials :

- (i) Classification of magnetic materials into soft and hard magnetic materials.
- (ii) Soft magnetic materials - high silicon alloy steel for transformers and low silicon alloy steel, for electric rotating machine cold rolled grain oriented and non-oriented steel, Nickel iron alloy, soft ferrites, their properties and uses.
- (iii) Hard magnetic materials - tungsten steel, chrome steel, cobalt steel, alnico, hard ferrites, their properties and applications.

5. Semiconductor Materials

Introduction, semiconductor and their applications Different semiconductor materials used in manufacturing various semiconductor (Si &Ge), Material used for electronic components like resistor, capacitor, diode, transistors and inductors.

6. Special Purpose Materials :

Materials used in transistor and IC manufacturing, PC BS, computer memory devices (name of such materials to be added) Ferrous and non ferrous materials. Thermistor, Sensistor, Varistor and their practical Application.

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I Year II Semester

DEE-201 APPLIED MATHEMATICS II

1. INTEGRAL CALCULUS - I:

Methods of Indefinite Integration :-

- 1.1 Integration by substitution.
- 1.2 Integration by rational function.
- 1.3 Integration by partial fraction.
- 1.4 Integration by parts.

2. INTEGRAL CALCULUS -II :

- 2.1 Meaning and properties of definite integrals, Evaluation of definite integrals. Integration of special function.
- 2.2 Application : Finding areas bounded by simple curves, Length of simple curves, Volume of solids of revolution, centre of mean of plane areas.
- 2.3 Simpsons 1/3rd and Simpsons 3/8th rule and Trapezoidal Rule : their application in simple cases.

3. CO-ORDINATE GEOMETRY (2 DIMENSION):

- 3.1 CIRCLE : Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.
- 3.2 Standard form and simple properties
Parabola $x^2=4ay, y^2=4ax,$
Ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

4. CO-ORDINATE GEOMETRY (3 DIMENSION):

- 4.1 Straight lines and planes in space -Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line and Plane (Different Forms),
- 4.2 Sphere $x^2 + y^2 + z^2 + 2gx + 2fy + 2wz = d$ (Radius, Centre and General Equation)

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I Year II Semester

DEE-202 APPLIED PHYSICS-II

1. Optics :

Nature of light, Laws of Reflection and Refraction, Snell's Law, Interference (Constructive and Destructive), Diffraction and Polarization (Concept Only), Law of Malus and Polaroid's.

1. Introduction To Fibre Optics :

Critical angle, Total internal reflection, Principle of fiber optics, Optical fiber, Pulse dispersion in step-index fibers, Graded index fiber, Single mode fiber, Optical sensor.

3. Lasers and its Applications :

Absorption and Emission of energy by atom, Spontaneous and Stimulated Emission, Population inversion, Main component of laser and types of laser- Ruby Laser, He-Ne laser and their applications. Introduction to MASER.

4. Electrostatics :

Coulomb's Law, Electric field, Electric potential, Potential energy, Capacitor, Energy of a charged capacitor, Effect of dielectric on capacitors.

5. D.C. Circuits :

Ohm's Law, Kirchoff's Law and their simple application, Principle of Wheat Stone bridge and application of this principle in measurement of resistance (Meter bridge and Post Office Box); Carey Foster's bridge, potentiometer.

6. Magnetic Materials and Their Properties:

Dia, Para and Ferro-magnetism, Ferrites, Magnetic Hysteresis Curve and its utility. Basic idea of super conductivity, Meissner's effect.

7. Semiconductor Physics :

Concept of Energy bands in solids, classification of solids into conductors, insulators and semiconductors on the basis of energy band structure. Intrinsic and extrinsic semiconductors, Electrons and holes as charge carriers in semiconductors, P-type and N-type semiconductors.

8. Junction Diode and Transister :

Majority and Minority charge carriers P-N junction formation, barrier voltage, Forward and reverse biasing of a junction diode, P-N junction device characteristics, Formation of transistor, transistor-action, Base, emitter and collector currents and their relationship LED's.

9. Introduction To Digital Electronics :

Concept of binary numbers, Inter conversion from binary to decimal and decimal to binary. Concepts of Gates (AND, NOT, OR).

10. Non-conventional energy sources:

- (a) Wind energy : Introduction, scope and significance, measurement of wind velocity by anemometer, general principle of wind mill.
- (b) Solar energy: Solar radiation and potentiality of solar radiation in India, uses of solar energy: Solar Cooker, solar water heater, solar photovoltaic cells, solar energy collector.

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I Year III Semester

APPLIED PHYSICS-II

PHYSICS LAB

Note: Any 4 experiments are to be performed.

1. Determination of coefficient of friction on a horizontal plane.
2. Determination of 'g' by plotting a graph T^2 versus l and using the formula $g=4\pi^2/\text{Slope of the graph line}$
3. Determine the force constant of combination of springs in case of
1. Series 2. Parallel.
4. To verify the series and parallel combination of Resistances with the help of meter bridge.
5. To determine the velocity of sound with the help of resonance tube.
6. Determination of viscosity coefficient of a lubricant by Stoke's law.
7. Determination of E_1/E_2 of cells by potentiometer.
8. Determination of specific resistance by Carry Foster bridge.
9. Determination of resistivity by P.O.Box.
10. Verification of Kirchhoff's Law.
11. To draw Characteristics of p-n Junction diode.
12. To measure instantaneous and average wind velocity by indicating cup type anemometer/hand held anemometer.

NOTE : Students should be asked to plot a graph in experiments (where possible) and graph should be used for calculation of results. Results should be given in significant figures only.

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II Year III Semester

DEE- 203 BASIC ELECTRICAL ENGINEERING

1. Basic Terminology and their concepts

- 1.1 Current, EMF, potential difference (Voltage), resistance, resistivity their units conductors & insulators, Insulation resistance of a cable.
- 1.2 Effect of temperature on the resistance of conductors, semiconductors (C, Si, Ge) and insulators physical explanation, temperature coefficient of resistance.
- 1.3 Electrical power, energy and their units (SI), Heating effect of electric current and its practical examples.
- 1.4 Relationship between electrical, mechanical and thermal SI units of work, power and energy, Electrical Safety and precautions.

2. D.C. Circuits

- 2.1 Kirchoff's laws.
- 2.2 Simple numerical problems based on Kirchoff's laws.
- 2.3 Introduction to Thevenin and Superposition theorem, Norton's theorem

3. Batteries

- 3.1 Construction, chemical changes during charging and discharging of lead acid cells.
- 3.1 (a) Indications of a fully charged battery.
- 3.2 Capacity and efficiency of lead acid cell / battery.
- 3.3 Charging of 6 V., 12 V. commercial batteries.
- 3.3 (a) Grouping of cells.
- 3.4 Care and maintenance of commercial batteries.
- 3.5 Problems/defects in lead acid batteries.
- 3.6 Concept of Nickel-Iron and Nickel Cadmium Batteries.
- 3.7 Concept of solid sealed maintenance free batteries (SMF batteries), Oxygen recombination principle.

4. Capacitors

- 4.1 Concept of capacitor, types of capacity of parallel plate capacitor, Composite capacitor and effect of physical parameters.
- 4.2 Energy stored in a capacitor, dielectric and its influence on capacitance of a capacitor, dielectric constant dielectric breakdown and dielectric strength. Dielectric loss.
- 4.3 Series and parallel combination of capacitors.
- 4.3(a) Capacitance of multi-plate capacitors.

- 4.4 Variable capacitors.
- 4.5 Charging and discharging of capacitors.
- 4.6 Simple problems on capacitors.

5. Electromagnetism

- 5.1 Concept of magnetic flux, flux density, magnetic field intensity, permeability and their units.
- 5.2 Magnetic circuits, concept of reluctance and m.m.f. and simple problems.
- 5.3 Analogy between electric and magnetic circuits.
- 5.4 B-H curve and magnetic hysteresis (No mathematical derivation).
- 5.5 Elementary ideas about hysteresis loss.
- 5.5(a) Lifting powers of a magnet.

6. Electromagnetic Induction

- 6.1 Faraday's laws of electromagnetic induction. Lenz's Law, simple problem. Dynamically induced emf.
- 6.2 Self induced emf, inductance, its role in electrical circuits. Simple problems.
- 6.3 Mutually induced emf, mutual inductance, its role in electrical circuits. Simple problems.
- 6.4 Energy stored in magnetic circuit.
- 6.5 Rise and decay of current in inductors.
- 6.6 Force on a current carrying conductor placed in a magnetic field and its applications.
- 6.7 Elementary idea about eddy current loss.

7. A.C. Circuits

- 7.1 Recapitulation of terminology, instantaneous value, maximum (peak) value, cycle, frequency, alternate current and voltage. Difference between AC and DC.
- 7.2 Equation of an alternating voltage and current and wave shape varying sinusoidally.
- 7.3 Average and RMS value of alternating voltage and current. Importance of RMS value. Simple problems.
- 7.4 Concept of phase, phase difference and phasor representation of alternating voltage and current.
- 7.5 A.C. through pure resistance, inductance, capacitance, phasor diagram and power absorbed.
- 7.6 R-L series circuit, idea of impedance and calculations.
- 7.7 Apparent power, reactive power and active power, power factor, its importance and simple problems.
- 7.8 R-C series circuit, simple problems.
- 7.9 R-L-C series circuit, simple problems.
- 7.10 Solution of simple parallel A-C circuits by
 - (a) Phasor diagram method,
 - (b) Admittance method.
- 7.11 Solution of AC circuits series/ parallel by j method. (simple problems).
- 7.12 Resonance (Series and parallel) and practical application, simple problems.

8. Transients and Harmonics

Introduction, Types of transients, Important differential equations, First and second order equations, Transients in R-L series circuits (D.C.), Short circuit current, Time constant, Transients in R-L series circuits (A.C.), Transients in R-C series circuits (D.C.), Transients in R-C series circuits (A.C.), Double energy transients, Fundamental wave and harmonics, Different complex waveforms, General equation of complex wave, R.M.S. value of a complex wave, Power supplied by complex wave, Harmonics in single phase A.C. circuits, Selective resonance due to harmonics, Effect of harmonics on measurement of inductance and capacitance.

9. Polyphase System

8.1 Introduction to polyphase system. Advantage of three phase system over single phase system.

8.2 Star and Delta connections. Relationship between phase and line value of currents and voltage. Power in polyphase circuits. Simple problems of balanced circuits only.

BASIC ELECTRICAL ENGG. LAB

- i) To show the variation of resistance of a lamp with temperature by plotting a V-I curve for 60W and 100W filament lamps.
- ii) To verify the Kirchoff's laws.
- iii) To observe the B-H curve for a ferro-magnetic core on CRO.
- iv) To find the relationship between voltage and current for R-L series circuit for variable resistances & variable inductance.
- v) To determine the variation in the values of inductance of a coil for different positions of the movable iron core.
- vi) To measure the power factor in a single phase AC circuit by using voltmeter, ammeter & wattmeter.
- vii) To test a battery for charged and discharged condition and to charge a battery.
- viii) Verification of voltage and current relations in Star and delta connected systems.
- ix) To charge and discharge a capacitor and to show the graph on C.R.O.
- x) Verification of laws of capacitors in series and parallel.

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I Year II Semester

DEE-204 ELECTRONICS - I

1. Semiconductor Diodes

Semiconductor materials N type and P Type P.N. junction its forward and reversed biasing; junction diode characteristics, static and dynamic resistances and their calculation from diode characteristics.

Diode (P-N junction) as , half wave, full wave rectifier including bridge rectifier, relationship between D.C. output voltage and A.C. input voltage, rectification efficiency and ripple factor for rectifier circuits, filter circuits, shunt capacitor, series inductor, capacitor input filter. Different types of diodes, brief idea of characteristics and typical applications of power diodes, zener diodes, varactor diodes, point contact diode, tunnel diodes, LEDs and photo diodes. Important specifications of rectifier diode and zener diode.

2. Bipolar Junction Transistor :

Concept of bipolar junction transistor as a two junction three terminal device having two kinds of charge carriers, PNP and NPN transistor, their symbols and mechanisms of current flow, explanation fundamental current relations. Concept of leakage current (I_{cbo}) effect of temperature on leakage current.

Standard notation for current and voltage polarity; CB, CE, and CC configurations.

Transistor input and output characteristics, concept of active, cut off and saturation region.

Common emitter configuration: current relations in CE configuration, collector current interms of base current and leakage current (I_{ceo}), relationship between the leakage current in CB and CE configuration, input and output characteristics, determination of dynamic input and output resistances and current amplification factor from the characteristics.

3. Single Stage Transistor Amplifier

Single stage CE amplifier with proper biasing circuit and its working as voltage amplifier. AC load line and its use .

(a) Explanation of phase reversal of the output voltage with respect to input voltage.

Introduction to tuned voltage amplifier.

4. FIELD EFFECT TRANSISTOR (FET), MOSFET & CMOS

A. FET :

- Construction, operation, characteristics and Biasing of Junction FET.
- Analysis of Single stage CB, CG and CD amplifier. (Only Brief Idea)

B. MOSFET :

- Construction, operation, characteristics and Biasing of MOSFET in both depletion and enhancement modes.
- Analysis of Single stage CB, CG and CD amplifier.(Only Brief Idea)

C. CMOS :

- Construction, operation, characteristics of CMOS in both depletion and enhancement modes.
- Use of CMOS as Inverter, Different Application of CMOS, CMOS IC.
- Comparisons of JEET, MOSFET and Bipolar transistor.

5. MULTISTAGE & POWER AMPLIFIERS:

5.1 Need of multistage amplifier, different coupling schemes and their working, brief mention of application of each of the type of coupling.

5.2 Working of R.C. coupled and transformer coupled multistage amplifier, approximate calculation of voltage gain and frequency response for a two stage R-C coupled amplifier.

Working principles of push pull amplifier circuits its advantages over single ended power amplifier.

6. Feedback in Amplifiers

Basic principles and types of feedback, derivation of expression for the gain of an amplifier employing feedback. Effect of negative feedback on gain, stability, distortion, and band width.(only physical explanation) typical feedback circuits:

- (a) RC coupled amplifiers with emitter by-pass capacitor removed.
- (b) Emitter follower, complementary symmetry power amplifier and its applications.

7. Regulated Power Supply

7.1 Concept of regulation.

7.2 Basic regulator circuits (using zener diode).

7.3 Concept of series and shunt regulator circuits.

7.4 Three terminal voltage regulator Ics (positive negative and variable) application. Block diagram, Pin configuration and working of popular regulator IC.

8. OSCILLATORS:

8.1 Application of oscillators.

8.2 Use of positive feedback/negative resistance for generation of oscillation, Barkhausen's criterion for oscillations.

ELECTRONICS- I LAB:

1. Semiconductor diode : identification of types of packages, terminals and noting different ratings using data books for various types of semiconductor diodes (germanium, point contact, silicon low power and high power and switching diode).
2. Rectifier circuits using semiconductor diode measurement of input and output voltage and plotting of input and output wave shapes:
 - i) Half wave rectifier
 - ii) Full wave rectifier (centre tapped and bridge rectifier circuits).
3. Plot the wave shapes of a full wave rectifier with shunt capacitor, series inductor, and filter circuit
4. Single stage common emitter amplifier circuit
 - i) Measurement of voltage gain at 1 KHZ for different load resistances.
 - ii) Plotting of frequency response of a single stage amplifier circuit.
 - iii) Measurement of input and output impedance of the amplifier circuit.
5. To measure the overall gain of two stage R.C coupled amplifier at 1 KHZ and note the effect of loading of second stage on the first stage.
6. (a) To plot the load Vs output power characteristic to determine the maximum signal input for undistorted signal output.
(b) The above experiment is to be performed with single ended power amplifier, transistorized push pull amplifier. Complementary symmetry power amplifier.
7. To observe the effect of a by-pass capacitor by measuring voltage gain and plotting frequency response for a single stage amplifier.
8. To measure input and output impedance of a feedback amplifier with and without by-pass capacitor.
9. Measurement of voltage gain, input and output impedance and plotting of frequency response of an emitter follower circuit.
10. Plot the FET characteristics and determination of its parameters from these characteristics.
11. To test adjustable IC regulator and current regulator.
12. Identification of Some Popular IC of 74 and 40 series with Pin Number and other details.
13. Application and use of Multimeter, CRO, Audio Oscillator and
14. Power Supply (D.C.)

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I Year II Semester

DEE- 205 ENGINEERING DRAWING

NOTE : Latest Indian Standards Code of Practice to be followed.

1. Drawing, instruments and their uses. 1 Sheet
 - 1.1 Introduction to various drawing, instruments.
 - 1.2 Correct use and care of Instruments.
 - 1.3 Sizes of drawing sheets and their layouts.

2. (a) Lettering Techniques 2 Sheet

Printing of vertical and inclined, normal single stroke capital letters.
Printing of vertical and inclined normal single stroke numbers. Stencils and their use.

(b) Introduction to Scales 2 Sheet
Necessity and use, R F Types of scales used in general engineering drawing. Plane, diagonal and chord scales.

3. Conventional Presentation: 1 Sheet

Thread (Internal and external), Welded joint, Types of lines, Conventional representation of materials, Conventional representation of machine parts.

4. (a) Principles of Projection 1 Sheet

Orthographic, Pictorial and perspective Concept of horizontal and vertical planes.
Difference between I and III angle projections. Dimensioning techniques.

(b) Projections of points, lines and planes. 1 Sheet

- 5 (a) Orthographic Projections of Simple 2 Sheet

Geometrical Solids Edge and axis making given angles with the reference planes. Face making given angles with reference planes. Face and its edge making given angles with reference planes.

(b) Orthographic views of simple composite solids from their isometric views.

(c) Exercises on missing surfaces and views

6. Section of Solids 2 Sheet

Concept of sectioning
Cases involving cutting plane parallel to one of the reference planes and perpendicular to the others. Cases involving cutting plane perpendicular to one of the reference planes and

inclined to the others plane, true shape of the section

7. Isometric Projection. 2 Sheet
Isometric scale Isometric projection of solids.
8. Free hand sketching 1 Sheet
Use of squared paper Orthographic views of simple solids Isometric views of simple job like carpentry joints
9. Development of Surfaces 2 Sheet
Parallel line and radial line methods of developments. Development of simple and truncated surfaces (Cube, prism, cylinder, cone and pyramid).
10. ORTHOGRAPHIC PROJECTION OF MACHINE PARTS: 2 Sheet
Nut and Bolt, Locking device, Wall bracket
11. PRACTICE ON AUTO CAD : 2 Sheet
Concept of AutoCAD, Tool bars in AutoCAD, Coordinate System, Snap, Grid and Ortho mode. Drawing Command - Point, Line, Arc, Circle, Ellipse. Editing Commands - Scale, Erase, Copy, Stretch, Lengthen and Explode. Dimensioning and Placing text in drawing area. Sectioning and hatching. Inquiry for different parameters of drawing.

NOTE :

- A. The drawing should include dimension with tolerance wherever necessary, material list according to I.S. code. 25% of the drawing sheet should be drawn in first angle projection and rest 75% drawing sheet should be in third angle figure
- B. Practice on AutoCAD latest software is to be done in AutoCAD lab of Mechanical Engineering Department of the Institute.

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Evaluation Scheme & Syllabus
Diploma in Electrical Engineering
II Year- III & IV Semester)
(Effective from session 2019-20)

Department of Electrical Engineering
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P.K. University, Shivpuri (MP)
II Year III Semester

DEE-301 Functional Communication

Section “A” (English)

Text Lessons

Unit I.	On Communication
Unit.II	Exploring Space
Unit.III	Sir C.V. Raman
Unit.IV	Professional Development of Technicians
Unit.V	Buying a Second Hand Bicycle
Unit.VI	Leadership and Supervision
Unit.VII	First Aid
Unit.VIII	The Romanance of Reading
Unit.IX	No Escape from Computers
Unit.X	Bureau of Indian Standards

Section “B” Hindi

- 1- स्वरोजगार
- 2- भारतीय वैज्ञानिकों एवं तकनीकियों का भारत के विकास में योगदान
- 3- ग्राम्य विकास
- 4- परिवार नियोजन
- 5- सामाजिक संस्थायें
- 6- नियोजन और जन कल्याण
- 7- भारत में प्रौद्योगिकी के विकास का इतिहास
- 8- हरित क्रांति
- 9- पर्यावरण एवं मानव प्रदूषण
- 10- श्रमिक कल्याण
- 11- भारत में श्रमिक आन्दोलन

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II Year III Semester

DEE-302 APPLIED MATHEMATICS III

1. MATRICES:

- 1.1 Algebra of Matrices, Inverse : Addition, Multiplication of matrices, Null matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermitian, Orthogonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix. Definition and Computation of inverse of a matrix.
- 1.2 Elementary Row/Column Transformation :Meaning and use in computing inverse and Rank of a matrix.
- 1.3 Linear Dependence, Rank of a Matrix :Linear dependence/independence of vectors, Definition and computation of a rank of matrix. Computing rank through determinants, Elementary row transformation and through the concept of a set of independent vectors, Consistency of equations.
- 1.4 Eigen Pairs, Cayley-Hamilton Theorem :Definition and evaluation of eign values and eign vectors of a matrix of order two and three, Cayley-Hamilton theorem (without Proof) and its verification, Use in finding inverse and powers of a matrix.

2. DIFFERENTIAL CALCULUS :

- 2.1Function of two variables, identification of surfaces in space, conicoids
- 2.2Partial Differentiation : Directional derivative, Gradient, Use of gradient f, Partial derivatives, Chain rule, Higher order derivatives, Eulens theorem for homogeneous functions, Jacobians.
- 2.3Vector Calculus :Vector function, Introduction to double and triple integral, differentiation and integration of vector functions, gradient, divergence and curl, differential derivatives.

3. DIFFERENTIAL EQUATION:

- 3.1 Formation, Order, Degree, Types, Solution :Formation of differential equations through physical, geometrical, mechanical and electrical considerations, Order, Degree of a differential equation, Linear, Nonlinear equation.
- 3.2 First Order Equations: Variable seperable, equations reducible to seperable forms, Homogeneous equtions, equtions reducible to homogeneous forms, Linear and Bernoulli form exact equation and their solutions.
- 3.3 Higher Order Linear Equation :Property of solution, Linear differential equation with constant coefficients (PI for $X=e^{ax}$, $\sin ax$, $\cos ax$, X^n , $e^{ax}V$, XV).
- 3.4 Simple Applications : LCR circuit, Motion under gravity, Newton's law of cooling, radioactive decay, Population growth, Force vibration of a mass point attached to spring with and without damping effect. Equivalence of electrical and mechanical system

4. INTEGRAL CALCULUS - II:

4.1 Beta and Gamma Functions: Definition, Use, Relation between the two, their use in evaluating integrals.

4.2 Fourier Series: Fourier series of $f(x)$, $-n < x < n$, Odd and even function, Half range series.

4.3 Laplace Transform : Definition, Basic theorem and properties, Unit step and Periodic functions, inverse Laplace transform, Solution of ordinary differential equations.

5. PROBABILITY AND STATISTICS :

5.1 Probability: Introduction, Addition and Multiplication theorem and simple problem.

5.2 Distribution: Discrete and continuous distribution, Binomial Distribution, Poisson Distribution, Normal Distribution..

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DEE-303 ELECTRICAL INSTRUMENTS AND MEASUREMENTS

1 Introduction to electrical measuring instruments:

- 1.1 Concept of measurement and instruments.
- 1.2 Electrical quantities and instruments for their measurements.

2. Measurement and Errors.

- 2.1 Accuracy, precision, types of errors, probability of errors and Gaussian Errors curve, sensitivity, resolution and stability. Classification of errors.
- 2.2 Types of electrical measuring instruments, indicating, integrating and recording instruments.
- 2.3 Essentials of indicating instruments, deflecting, controlling and damping torques.

3. Ammeters and voltmeters (moving coil and moving iron type)

- 3.1 Concept of ammeters and voltmeters and difference between them.
- 3.2 Construction and working principle of moving coil and moving iron instruments. Merits and demerits.
- 3.3 Extension of range, use of C.T. & P.T.

4. Wattmeters (Dynamometer type) and Maximum Demand Indicator:

- 4.1 Construction, working principle, merits and demerits of dynamometer type wattmeter
- 4.2 Power measurement in three phase circuit by wattmeter and three wattmeter methods, simple problems.
- 4.4 Construction and working principle of maximum demand indicators.

5. Energy meter (Induction type):

- 5.1 Construction, working principle, merits and demerits of single-phase and three phase energy meters.
- 5.2 Testing of energy meters for calibration. Errors and compensation. Simple problems.
- 5.3 Digital Energy meter (Single Phase/Three Phase) Construction working and application .
- 5.4 Trivector Meter, Construction, Working & Its Application.

6. Miscellaneous Measuring Instruments:

The construction, working principle and application of: ohm-meter, meggar, earth tester, multimeter, frequency meter (reed-type) single phase power factor meter (Electrodynamometer type), 3-phase power factor meter, phase sequence indicator, Synchro scope.

7.Electronic Instruments:

- 7.1 Cathode Ray Oscilloscope, construction, working of CRO. Simple applications (like measurement of voltage current and frequency).
- 7.2 Introduction to electronic multimeter, analog multimeter, digital multimeters and V.T.V.M.

8.Measurement of Resistance Inductance and Capacitance

- 8.1 Bridges : Maxwell bridge, Wein's bridge and Schering bridge.
- 8.2 Potentiometer, Kelvin's double bridge.

9.Elements of Process Instrumentation

- 9.1 Block diagram of process instrumentation system and purpose of each block.
- 9.2 Basic principles of various sensors/transducers for measurement of temperature, pressure, strain and liquid level.

ELECTRICAL INSTRUMENTS AND MEASUREMENT LAB

- (i) To extend the range of an ammeter/voltmeter.
- (ii) To convert an ammeter into voltmeter.
- (iii) To calibrate 1-phase energymeter by direct loading method.
- (iv) To make proper connections of indicating/integrating instruments in a circuit e.g. wattmeter, frequency meter, power factor meter, 1-phase and 3-phase energymeter (Analog type/ Digital Type) etc.
- (v) To measure power, power factor in a 1-phase circuit using wattmeter and power factor meter and verify results with calculations.
- (vi) Measurement of power and power factor of a 3-phase balanced load by 2 wattmeter method.
- (vii) Measurement of voltage, frequency of a sinusoidal signal with C.R.O.
- (viii) Measurement of resistance, voltage, current with electronic multimeters (Analog & Digital) and compare the reading.

- (ix) To measure strain by transducer.
- (x) To measure inductance by Maxwell's bridge.
- (xi) To measure capacitance by Wein's/Schering bridge.
- (xii) To calibrate three phase energy meter with the help of standard 3 phase energy meter.
- (xiii) To connect a Trivector meter in a three phase circuit and make measurement of different quantities.

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II Year III Semester
DEE-304 ELEMENTARY MECH. & CIVIL ENGG.

1. **Applied Mechanics:** General condition of equilibrium of a rigid body under coplaner forces. Concept of tie, strut, beam and trusses. Shear force and bending moment diagram of simply supported beam and cantilever for point load. Concept of centre of gravity, moment of inertia and friction. Mechanical advantage, velocity ratio, mechanical efficiency of simple machines: Lifting machines such as pulley, differential pulley, wheel and axle, simple screw jack, worm and worm wheel.
2. **Strength of Materials & Power Transmission:** Stress, strain, elastic constraints, stress in circular shaft subjected to pure torsion only. Rivetted and bolted joints. Power transmission by solid and hollow shaft. Gear trains - simple and compound, fly wheel. Rope and belts - velocity ratio, length, size of belt and power transmitted.
3. **Hydraulics & Hydraulic Machines:** Properties of fluids, pressure of fluid and its measurement. Flow of fluids velocity and discharge, Bernoulli's theorem and its application in venturimeter, flow through pipe, head loss due to friction. water turbines- Pelton and Reaction, reciprocating and centrifugal pump.
4. **Heat Engines:** External & internal combustion engines, working of diesel and Petrol engine, horse power of IC engines, steam generator, construction and working of Babcock & Wilcox boiler, Cochran boiler, condenser, steam turbine classification and principle of operation, gas turbine.
5. **Civil Engineering Materials:** General idea of raw materials, manufacturing process, properties and uses of Bricks, lime, cement and Timber.
6. **Foundation** (i) Bearing capacity of soil and its importance, need of foundation for electrical machines.
(ii) Foundations for heavy, light and vibrating machines.
(iii) Concrete proportion, mixing w/c ratio, workability of RCC and its use.
7. **Surveying**
 - (i) Basics of chaining and leveling
 - (ii) Description of Instruments used

ELEMENTRY MECH. & CIVIL ENGG. LAB.

Part I :(Mechanical Engineering Laboratory/Hydraulics laboratory)

- (i) To operate a diesel engine (starting, running and shutting down) and to study lubricating and cooling system of the engine.
- (ii) To determine BHP of diesel or petrol engine and show that BHP is directly proportional to revolution per minute of engine shaft.
- (iii) To determine mechanical advantage, velocity ratio, efficiency and effort loss due to friction in screw jack.
- (iv) To verify Bernoulli's theorem with the help Bernoulli's apparatus.
- (v) To determine head loss due to friction in GI pipes.
- (vi) To operate the Pelton wheel and Francis Turbine and to understand its construction and working.
- (vii) To perform tensile test on mild steel and aluminum wire specimen and compare the result.
- (viii) To do alignment and coupling of a motor generator set.

Part II: (Civil Engineering Laboratory):

(i) Chain survey of a small area

- (a) Ranging a line
- (b) Chaining a line
- (c) Taking offset on the chain line and recording the field book.

(ii) Leveling

- (a) To find the difference in level between several points by single setting by the use of dumpy level.
- (b) To find the difference in level between two distant points by
 - (i) Rise & Fall method,
 - (ii) Line of collimation method.

Models:

1. Cut section models of turbine, pumps.
2. Cut section models boilers, condensers.
3. Cut section models of diesel and petrol engines.
4. Models showing power transmission by, rope, belt, chain and gears.
5. Models of clutch and brakes, shaft coupling.
6. Model of chain pulley block and three systems of pulleys.

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II Year III Semester

DEE-305 ELECTRICAL MACHINE - I

1. Generalised Treatment of Electrical Machines:-

- 1.1 Definitions of motor and generator.
- 1.2 Torque due to alignment of two magnetic fields and concept of torque angle
- 1.3 Elementary concept of generator and motor
- 1.4 Classification of main types of electrical machine and their generalised treatments in respect of their Working (only d.c. machine to be dealt with).
- 1.5 Common features of rotating electrical machines.

2. D.C. Machines

- 2.1 Construction of d.c. machines.
- 2.2 E.M.F. equation
- 2.3 Electromagnetic torque (torque equation)
- 2.4 Principle of generating and motoring action.
- 2.5 Speed and torque equation
- 2.6 Armature reaction and commutation in d.c. m/cs.
- 2.7 Factors controlling speed of d.c. motor.
- 2.8 Speed control methods and starters for d.c. m/cs.
- 2.9 Characteristics and application of D.C. generators and motors.

3. Transformer

- 3.1 Classification, construction, principle and working of 1 ph. and 3 ph. transformer.
- 3.2 E.M.F. equation.
- 3.3 Phasor diagram on no load and load.
- 3.4 Transformer connections.
- 3.5 Losses and efficiency.
- 3.6 Voltage drops and regulation.
- 3.7 Connections for parallel operation.
- 3.8 Cooling
- 3.9 Testing of transformer as per IS specification (Type test and routine test, etc.)
- 3.10 Special transformer - current transformer, potential transformer, auto transformer, rectifier transformer, dry type transformer, furnace transformer, traction transformer and its use.
- 3.11 Welding transformer: constructional detail, comparison between power and Welding transformer.

4. A. C. Generator (Alternator)

Working principle, construction, Full pitch and short pitch winding, pitch factor or coil span factor, distribution or winding factor, E.M.F. equation, Rating of alternators, armature reaction, voltage drops in alternator, vector diagram of loaded alternator, voltage regulation and its determination, Efficiency of alternator, conditions for parallel operation, Methods of parallel operation, Operation of alternators when connected to infinite bus bar. Voltage regulator like turrill and brown bovery type.

ELECTRICAL MACHINE LAB

1. Measurement of induced emf and magnetizing current under open circuit condition in D.C. generators.
2. Determination of the relationship between terminal voltage and load current keeping speed constant for
 - (a) Separately excited generator keeping excitation constant
 - (b) D.C. shunt generator.
3. To measure the variation in no load speed of a separately excited d.c. motor for the variation in
 - (a) Armature circuit resistance
 - (b) Field circuit resistance.
4. Measurement of the speed of a d.c. series motor as a function of the load torque.
5.
 - (a) No-load and short circuit test on a single phase transformer.
 - (b) Determination of efficiency and regulation of transformer.
6. To determine the insulation resistance of transformer at no load and at full load condition.
7. Determination of the magnetization curve of an alternator
 - (a) at no-load rated Speed, (b) at no load half rated speed (c) at full non-inductive Load and rated speed.
8. Determination of the relationship between terminal voltage and load current of an alternator keeping excitation and speed constant.
9. Determination of regulation and efficiency of an alternator from open circuit and short circuit tests.
10. Parallel operation of polyphase alternators and load sharing.

DEE-306 INTRODUCTION TO COMPUTER LAB

List of Practical's

1. Practice on utility commands in DOS.
2. Composing, Correcting, Formatting and Article (Letter/Essay/Report) on Word Processing tool Word and taking its print out.
3. Creating, editing, modifying tables in Database tool.
4. Creating labels, report, generation of simple forms in Database tool.
5. Creating simple spread sheet, using in built functions in Worksheet tool..
6. Creating simple presentation.
7. Creating mail ID, Checking mail box, sending/replying e-mails.
8. Surfing web sites, using search engines.

Note : In the final year, related students have to use the concept of MS Word/MS Excel/MS Access/MS Power Point in their respective branch's project work such as creating project report through MS Word/Creation of statistical data in MS Excel/Creation of database in MS Excel/ Demonstration of project through Power Point Presentation.

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II Year IV Semester

DEE-401 ELECTRONICS – II

1. Digital Electronics:

- (i) Introduction - Basic difference between analog and digital signal; Advantages of digital system and its field of applications.
- (ii) Number system - Binary, Decimal, Octal and Hexadecimal and their need.
- (iv) **A. Logic Gates** - Symbol and truth tables of AND, OR NOT, NAND, NOR And EX-OR gates. Boolean theorems and postulates (without proof) Realization of small Boolean functions and reduction using Karnaugh's Map up to 3 variables using logic gates and vice-versa.
B. Logic Families- TTL, CMOS, MOS, ECL, DTL, HTL, IIL.
- (iv) Half Adder and full adder circuits and their operations, Display Devices.
- (v) Encoder, Decoder, Multiplexer and Demultiplexer.
- (vi) Need of Flip-Flops, Detail idea of counters and (Synchronous and Asynchronous) and resistor with purpose. Idea of astable, monostable, Bistable multivibrators.
- (vii) A/D and D/A conversion.

2. Operational Amplifiers

Specifications of ideal operational amplifier and its block diagram as an Inverter, scale changer, adder, subtractor, differential amplifier, buffer Amplifier, differentiator, integrator, Schmitt trigger and log and antilog Amplifiers.

3. Microprocessors

- (i) Microprocessors and its need in modern technology.
- (ii) Functional block diagram of microprocessors and function of its various Blocks with reference to 8085 microprocessors. Concepts of and Assembly Language programming with 8085.

4. Communication Engineering

- (i) Basic block diagram of a modern communication system and its working.
- (ii) Concept of modulation/demodulation its need and types.
- (iii) Concept of demodulation its need and types.
- (iv) Introduction to digital and data communication.
- (v) Introduction to modern ways of communication- Brief idea and concept of optical Fiber communication, Microwave communication, Satellite communication and Mobile communication.

5. INTEGRATED CIRCUITS

- (i) Introduction to IC and its importance in modern electronics, types of IC's.
- (ii) Difference between SSI, MSI, LSI, VLSI.

NOTE: Only brief idea of above topics should be given.

ELECTRONICS II LAB

10 experiments are to be performed at least 4 from each group

A - Digital Electronics

1. Familiarizations with bread-board. Familiarizations with TTL and MOS ICs.
2. Identification of IC-No's, pin no's, IC types.
3. To observe that logic low and logic high do not have same voltage value in INPUT and OUTPUT of a logic gate.
4. To observe the propagation delay of TTL logic gate.
5. Observation of differences between MOS and TTL gate under the following heads:
(a) Logic levels (b) Operating voltages.
6. Use of Op-Amp. (for IC 741) as inverting and non inverting amplifier, adder, Comparator, buffer, scale changer.
7. Use of IC 755 as timer. Display Devices and Associated Circuits
8. Familiarizations and use of different types of LEDs common anode and Common cathode seven segment display Logic Gates
9. Verification of truth tables for 2 Input NOT, AND, OR NAND, NOR, XOR GATES.
10. To construct half adder and half subtractor using XOR and NAND gates Verification of their truth tables.
11. To construct a full adder circuit with XOR and NAND gates.
(a) Study of 3 bit adder circuit implemented with OR and NAND gates.
(b) To construct 4 bit adder and full subtractor using full adder chip 7480 and NAND GATES.
12. (a) To verify the truth table of 4 bit adder IC chip 7483.
(b) To construct the 4-bit adder/2 complement subtract using 7483 and AND Gates.

12. Flip Flops

To verify the truth table for selected positive edge triggered and negative Edge triggered F/F of J-K and D type.

13. Counters

To construct and verify truth table for asynchronous bin and decade counter Using J-K flip flops.

- (a) To construct divide by 60 counter using ripples counter IC Chips.
- (b) To use counter IC chip 7493 in the divided by eight mode and divide by Sixteen modes.
- (c) To construct a divide by 100 counter using CMOS
To construct a divide by 60 counter using synchronous counter IC chips.

14. Registers

To construct a 4 bit buffer register using 4 bit register IC chips.

To construct a 4 bit universal shift register using flip flops.

To use a 4035 B universal shift registers.

B-Microprocessor;

1. Familiarization with 8085 and 8088 Trainer.
2. Add two 8 bit numbers.
3. a) Obtain 2's complement of 8-bit numbers.
b) Subtraction of two numbers using 2's complement.
4. Extract fifth bit of a number in A and store it in another register.
5. Count No. of bits in high state in accumulator.
6. Check even parity and odd parity.
7. a) Add two 16-bit numbers by repetitive addition.
b) Divide two 8-bit numbers by repetitive sub-traction.
8. a) Smallest number of three digits.
b) Largest number of three digits.
9. Arrange numbers in ascending order.
10. Write a program to find out sum of first n-multiplier of a number.
11. Arrange number in descending order.
15. Use of Op-Amp. (For IC-741) as Inverting and non-inverting amplifier, Adder, comparator, buffer, scale changer.

NOTE: Every Student should fabricate a Mini Project based on Solid State Device.

Department of Electrical Engineering

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P.K. University, Shivpuri (MP)

II Year IV Semester

DEE-402 ELECTRICAL DESIGN, DRAWING & ESTIMATING-I

1. Electrical Symbols and Diagrams:

- (i) Need of symbols; List of symbols for electrical equipments and Accessories used in electrical light fan and power circuits, alarm and Indicating circuit, contactor control circuits as per I.S.S.
- (ii) Type of diagrams - Wiring diagrams (multiple and single line Representation) and schematic diagrams as per I.S.S.
 - * One Drawing Sheet for at least - 50 symbols.

2. Wiring materials and accessories:

- (1) Brief description, general specifications (as per I.S.S.) and approximate Cost of different types of wires, cables, switches, distribution board, switch Board, boxes, batten and its accessories, conduit and its accessories, lamp Holders, socket out lets, plug ceiling roses. Fuseamid energy meter used Indomestic and power wiring installations.
- (ii) Brief description, general specifications and approximate cost of Switches, push buttons, bells, indicating lights, indicating panels, Relay sexcused in alarm circuits.
 - * Study of materials and accessories in work shop.

3. Light and Fan Circuits:

Schematic and wiring diagrams (multiline and single line both) using Junction boxes and looping systems for the following types of circuits:-

- (i) Light and fan controlled by necessary switches and regulators.
- (ii) Stair case wiring
- (iii) Corridor lighting
- (iv) One lamp controlled by three or more switches.
 - * One drawing sheet for at least 4- problems.
 - * Wiring practice for at least 3-circuits.

4. Alarm Circuits:

Reading, designing and drawing schematic and wiring diagrams (multiline and single line) of following alarm circuits:-

- (i) Circuits meant to convey information by means of light only.
- (ii) Circuits meant to convey information by means of bell signals only. (One Bell controlled by one push button switch, Bell responds circuits using one Bell and relay, Bell responds circuits of an office or three rooms)
- (iii) Circuits meant to convey information by means of belland light both for Call signals.
- (iv) Circuits meant to convey information by means of bell and light to give 'Stop' and 'go' signals.
- (v) Traffic control light system for 2 road crossing
- (vi) A light circuit with gets automatically connected to DC supply in case of Power failure.
 - * 8-Drawing sheets for at least 6-problems of each type.
 - * Wiring practice for at least- 2-circuits of each type.

5. Estimation of Domestic Internal Wiring Circuits :(Small Houses)

- (i) Description of various wiring systems and methods.
- (ii) Need of earthing and point to be earthed in internal wiring system as per IE Rules.
- (iii) I.S.specifications, calculation of No. of points (light, fan, socket outlet Calculation of total load including domestic power, determination of no. of circuits, size of wires and cables, switches and main switch, distribution Board and switch board, batten conduit and other wiring accessories.
- (iv)Layout of installation plan, single linewiring, diagram, calculation of Length of batten/ conduit of different sizes and wire length; schedule of Materials.
- (v) Estimating for small houses using PWD/CPWD electrical schedule rates (E.S.R.)
 - * The drawing sheet for at least 4-layouts and circuits
 - * Estimation practice for at least - 2 installations each for small houses.

6. Assembly Drawings:-

- (i) Assembly drawing of simple electrical equipment from actual piece or from a pictorial view (carbon brush holder, open knife switch, miniature circuit breaker, motor terminal block and similar other electrical items).
 - * 2-Drawing sheets
- (ii) Poles, towers cables and insulators
 - * 2- Drawing sheets

7. Electrical Design:

Design of small transformers up to 1 KVA and chokes, heaters. Transformer Connections and bushing. 2 sheets Introduction to Computer Aided Design (AutoCAD)Of a small transformer, chock and bushing

8. Armature Winding of D.C.Machines:

Definition of terms used in winding, simple 2 Sheet Lap and Wave winding Exercises for d.c.motor and generator.

ELECTRICAL WIRING & FABRICATION SHOP

- 1.To prepare a folder/display board of accessories used in domestic wiring with complete specifications.
2. To prepare a display board of tools used in wiring and fabrication shop.
3. Batten wiring containing light, ceiling fan, socket points.
4. Staircase wiring using two way switches.
5. Connection of a fluorescent tube using starter, choke and single way switch and its fault detection.
6. Practice of domestic conduit wiring.
7. Testing of wiring installation by meggar.
8. Connection of mercury lamp along with accessories.
9. Making of an extension board containing two 5 A and 15 Amp plug points Controlled by individual switches using MCB/ELCB(Earth Leakage Circuit Braker).

Department of Electrical Engineering
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P.K. University, Shivpuri (MP)

II Year IV Semester

DEE-403 POWER PLANT ENGINEERING

1. Thermal Stations:

Main parts and working of stations-thermodynamic cycles, fuel handling, Combustion and combustion equipment, problem of ash disposal, circulating water schemes and supply of makeup, water, choice of pressure of steam generation and steam temperature, selection of appropriate vacuum; Economizer, air pre-heater feed water heaters and dust collection Characteristics of turbo alternators, steam power plant heat balance and efficiency.

2. Hydro-Electric Plants:

Hydrology, stream flow, hydrograph, flow duration curves. Types of hydro electric plants and their fields of use, capacity calculations for hydropower, Dams, head water control, penstocks, water turbines, specific speeds. Turbine governors. Hydro plant auxiliaries, plant layout, automatic and remote control of hydro plants, pumped storage projects, cost of hydro-electric project. Cooling of alternators.

3. Nuclear Power Plants:

Elements of nuclear power plant, nuclear reactor, fuels, Moderators, coolants, Control, Classification of nuclear Power stations. Cost of nuclear power.

4. Diesel Power Plants:

Diesel engine performance and operation. Plant layout. Log Sheets, applications Selections of engine size.

5. Gas Turbine Plants:

Plant layout, methods of improving output and performance. Fuels and fuel Systems. Methods of testing. Open and closed cycle plants. Operating Characteristics. Applications. Free piston on engine plants, limitation and Applications Non conventional energy sources.

6. Combined Working of Power Plants:

Advantages of combined working of different types of power plants. Need for Co-ordination of various types of power plant in power systems, base load Stations and peak load stations.

7. Non Conventional Source of Energy:

Introduction, Concept of Solar Energy, Bio Mass Energy, Wind Energy, Tidal Energy, Geothermal Energy, Microhydel Energy, Biodiesel Energy.

8. Recent Development:

Inter connection of P.S. - Meaning of Interconnection, combined operation of Hydro power station with inter connected base load and peak load, parallel Operation of inter connectors.

Department of Electrical Engineering
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II Year IV Semester

DEE-404 TRANSMISSION AND DISTRIBUTION OF

1. Electrical Design of Lines:

Layout of different transmission and distribution systems, advantages of High voltage transmission, HVDC convertor transformer concept of short Medium and Long lines, parameters of lines, performance of short Lines (Regulation, efficiency, vector diagrams) corona Formation and its effects On performance of Lines. Effect of provision of protection and demand Side management on reduction of T & D logic.

2. Constructional Features of Transmission Lines:

Constructional features of transmission lines, types of supports, types of Conductors, types of insulators, their properties, selection and testing, Voltage distribution of string insulators Equalization of potential. Vibration Dampers.

3. Economic Principle of Transmission:

Kelvin's law, limitations of Kelvin's law, Modification in Kelvin's law.

4. Mechanical design of lines:

Sag: Sag measurement, use of sag template Indian Electricity Rules Pertaining to clearance, stringing of lines.

5. Distribution System:

Feeders distributors and service mains, radial and Ring main distributors, A.C. distributors fed from one end and both ends. Simple problems on size of Feeders and distributors.

6. Construction of Distribution Lines:

Construction of distribution lines i.e. erection of Pole, fixing of insulators on conductors, testing, operation and maintenance of lines.

7. Power Factor Improvement:

Effect of low power factor, causes of low power factor, necessity for Improvement of power factor, methods for improving power factor. Advantages of improved power factor by installing capacitors at Consumer end.

8. Underground Cables:

Power cable construction, comparison of over head lines and underground Cables, laying of cables, cable jointing, using of epoxy resin kits. Fault Location, Murray loop test, testing of cables, Specifications.

9. Carrier Communication:

Principle of carrier communication over Power Lines, purposes, equipment, Difference between radio transmission and carrier communication, block Diagrams. Voltage control.

Faults and Production: Causes and types of fault i.e. L-L, L-G, L-L-G.
Awareness and concept of Energy conservation.

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Evaluation Scheme & Syllabus
Diploma in Electrical Engineering
III Year- V & VI Semester)
(Effective from session 2019-20)

Department of Electrical Engineering

(Faculty of Engineering & Technology)

P.K. University, Shivpuri (MP)

III Year V Semester

DEE-501 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

1. Principles of Management

- 1.1 Management, Different Functions: Planning, Organizing, Leading, Controlling.
- 1.2 Organizational Structure, Types, Functions of different departments.
- 1.3 Motivation: Factors, characteristics, methods of improving motivation, incentives, pay, promotion, rewards, job satisfaction, job enrichment.
- 1.4 Need for leadership, Functions of a leader, Factors for accomplishing effective leadership, Manager as a leader, promoting team work.

2. Human Resource Development

- 2.1 Introduction, objectives and functions of human resource development (HRD) department.
- 2.2 Recruitment, methods of selection, training strategies and career development.
- 2.3 Responsibilities of human resource management – policies and functions, selection – Mode of selection –Procedure – training of workers, Job evaluation and Merit rating.

3. Wages and Incentives

- 3.1 Definition and factors affecting wages, methods of wage payment.
- 3.2 Wage incentive – type of incentive, difference in wage, incentive and bonus; incentives of supervisor.
- 3.3 Job evaluation and merit rating.

4. Human and Industrial Relations

- 4.1 Industrial relations and disputes.
- 4.2 Relations with subordinates, peers and superiors.
- 4.3 Characteristics of group behavior and trade unionism.
- 4.4 Mob psychology.
- 4.5 Grievance, Handling of grievances.
- 4.6 Agitations, strikes, Lockouts, Picketing and Gherao.
- 4.7 Labour welfare schemes.
- 4.8 Workers' participation in management.

5. Professional Ethics

- 5.1 Concept of professional ethics
- 5.2 Need for code of professional ethics.
- 5.3 Professional bodies and their role.

6. Sales and Marketing management

- 6.1 Functions and duties of sales department.
- 6.2 Sales forecasting, sales promotion, advertisement and after sale Services.
- 6.3 Concept of marketing.
- 6.4 Problems of marketing.
- 6.5 Pricing policy, break even analysis.
- 6.6 Distribution channels and methods of marketing.

7. Labour Legislation Act (as amended on date)

- 7.1 Factory Act 1948.
- 7.2 Workmen's Compensation Act 1923.
- 7.3 Apprentices Act 1961.
- 7.4 PF Act, ESI Act.
- 7.5 Industrial Dispute Act 1947.
- 7.6 Employers State Insurance Act 1948.
- 7.7 Payment of Wages Act, 1936.
- 7.8 Intellectual Property Rights Act

8. Material Management

- 8.1 Inventory control models.
- 8.2 ABC Analysis, Safety stock, Economic ordering quantity.
- 8.3 Stores equipment, Stores records, purchasing procedures, Bin card, Cardex.
- 8.4 Material handling techniques.

9. Financial Management

- 9.1 Importance of ledger and cash book.
- 9.2 Profit and loss Account, Balance sheet.
- 9.3 Interpretation of Statements, Project financing, Project appraisal, return on investments.

10. Entrepreneurship Development

- 10.1 Concept of entrepreneur and need of entrepreneurship in the context of prevailing employment conditions.
- 10.2 Distinction between an entrepreneur and a manager.
- 10.3 Project identification and selection.
- 10.4 Project formulation.
- 10.5 Project appraisal.
- 10.6 Facilities and incentives to an entrepreneur.

11. Fundamental of Economics

- 11.1 Micro economics.
- 11.2 Macro economics.

12. Accidents and Safety

- 12.1 Classification of accidents based on nature of injuries, event and place.
- 12.2 Causes and effects of accidents.
- 12.3 Accident-prone workers.
- 12.4 Action to be taken in case of accidents with machines, electric shock, fires and erection and construction accidents.
- 12.5 Safety consciousness and publicity.
- 12.6 Safety procedures.
- 12.7 Safety measures – Do's and Don'ts and good housing keeping.

Department of Electrical Engineering
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III Year V Semester

DEE-502 SWITCH GEAR AND PROTECTION

1. Faults:

Types of faults, three phase symmetrical faults, effects of faults on system reliability and stability abnormalities, short circuits and their effects, representation of fault conditions through single line diagrams.

2. Switch Gear:

2.1 Purpose of protective gear, characteristics of a protection system.

2.2 Classification of fuses H.V. Fuses, application and working, grading and co-ordination L.V.Fuses, selection of fuses, characteristics.

2.3 Isolators and switches, outdoor isolators, functions, air break switches braking capacity of switches.

2.4 Circuit breakers: - requirements of circuit breakers definition of terms Associated with circuit-breakers, reasons for arc formation, principles Of arc extinction, types of circuit-breakers, comparison with oil circuit breaker classification, rating of circuit breakers, working of different types of air and oil circuit breaker, specification of circuitbreakers, maintenance schedule.SF-6 and circuit breakers.

2.5 Relays: Requirement of relays, operation principles induction type over Current, directional over current, differential, percentage differential relays working, applications and characteristics, basic principles of static relays. Introduction of distance relay.

3. Protective Schemes:

3.1 Protection of alternators, stator faults, rotor faults, mechanical conditions, external faults their reasons, effect and protections used.

3.2 Protection of power transformer: types of faults, its effects, types of protective schemes Over current earth fault, differential protection, buckholtz devices, winding temp. Protection.

3.3 Motor protection: types of faults and protection in motors, thermal relays, protection of small motors, under voltage protection.

3.4 Protection of feeders: radial, parallel and ring Feeders protection, directional time and current Graded schemes differential protection.

4. Protection Against Over Voltages:

4.1 Causes of over voltages, travelling wave's earth wire, protective zone, lightning arrestors, space-gap and electrolytic arrestors, surge absorber, location and rating of lightning arrestors Thyrite lightning Arrestor.

5. Different Type of Sub-Stations:-

5.1 Layout, single line diagram bus bar arrangement, equipments their functions, accessories, study of protective schemes, etc. batteries and their maintenance, operation of small sub-station.

5.2 Reactors: types of reactors, bus bar reactor, tuning reactor, arc-suppression reactor, connection of reactors in power stations. Uses of reactors.

5.3 Neutral grounding: - types of grounding solid grounding, reactance grounding, arc suppression coil grounding, choice of method of neutral earthing. Grounding of sub-station, grounding of line structure and substation equipment.

5.4 Concept of G.I.S. (Gas Insulated Substation).

Department of Electrical Engineering

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P.K. University, Shivpuri (MP)

III Year V Semester

DEE-503 INDUSTRIAL ELECTRONICS & CONTROL

1. Introduction:-

- (i) Control system classification and method of control.
- (ii) Concept of open loop and closed loop control.
- (iii) Introduction to automatic control.
- (iv) Role of power electronics in the field of control Engg.

2. High power switching devices

- (a) Power diode characteristics application of general purpose diode, fast recovery diode and Schott key diode.
- (b) Control switching devices, construction characteristics and application of S.C.R., power transistor.

3. Thyristor and their Operation:-

- (i) Thyristor and its types.
- (ii) SCR, Diac, Triac, their construction, characteristics and applications.
- (iii) UJT and its characteristics, LDR, LED and photo electric relay.
- (iv) Methods of switching ON and switching OFF SCR.
- (v) Phase control using SCR, Diac and Triac and concept of firing angle and its control. Heating, Welding and Temperature control using SCR.

4. Thyristor Application:-

- (i) Basic circuit and working of single phase, three phase, half wave, full wave and bridge power convertors (rectifiers) using SCR.
- (ii) Basic circuit and working of single phase and three phase bridge invertors using SCR.
- (iii) Basic circuit and working of D.C. and A.C. Choppers.
- (iv) Basic circuit and working of cyclo convertor.
- (v) Speed control of variable frequency drives.

5. Thyristor Control of Electrical Machines:-

A. Speed control of:

- (i) Single Phase & Three Phase Induction motors.
- (ii) D.C. motors

B. Industrial Control:-

- (i) Heating control using SCR.
- (ii) Welding control using SCR.
- (iii) Temperature, illumination and level control.
- (iv) Use of SCR and Triac as static switch.

6. PROGRAMMABLE LOGIC CONTROLLER (PLC) & SCADA):

Introduction, Principle of operation, Architecture of programmable controller, programming the programmable Controller, Application of programmable controller. Introduction to supervisory Control and Data Acquisition (SCADA), SCADA functional requirements and components, power system SCADA and SCADA in power system automation. SCADA communicator requirements.

7. Servo Mechanism:-

Introduction to servomechanism, block diagram open loop & closed loop system, DC & AC servo mechanism, servomotors, application, synchros & application.

INDUSTRIAL ELECTRONICS & CONTROL LAB

1. Fabrication and testing of electronic fan speed regulator.
2. Power control using Dics and Triacs.
3. Characteristics of SCR.
4. Speed control of DC shunt motor.
5. Characteristics of U.J.T. firing circuit of S.C.R.
6. Study of light operated relay using LDR or photo diode.
7. Experiment on Time Delay- Relay using SCR&UJT.
8. Study of servo motor and synchros.
9. Thyristersed speed control of 3 phase induction motor.
10. Fabrication and Testing of inverter circuit.

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III Year V Semester
DEE-504 ELECTRICAL MACHINE II

1. Induction Motor

- (i) Rotating magnetic field for 3 ph. concept of motors and its reversing.
- (ii) Construction and working of 3 ph. induction motor (squirrel cage and Wound rotor motor).
Double squirrel cage induction motor.
- (iii) Rotor frequency, rotor e.m.f., rotor current and rotor power factor.
- (iv) Torque equation
- (v) Torque slips characteristics.
- (vi) Principle and methods of speed control.
- (vii) Methods of starting of induction motor. On line, auto transformer, star-delta
Manual/automatic starters for induction motor. Starter for slip ring ind. motor.
- (viii) Application of induction motor .
- (ix) Testing of motor as per I.S. Performance of 3 phase induction motor with the help of circle diagram.
- (x) Losses and efficiency (simple problems only)
- (xi) Phasor diagram of induction motor.

2. Synchronous Motor

Construction, working principle, effect of load on synchronous motor, Vector diagram of synchronous motor, effect of change in excitation on the performance of synchronous motor, V curves, torque & mechanical power developed, condition for max. Mechanical power, synchronous condenser, hunting and its elimination, comparison between ind. motor and Synch. Motor, starting methods and uses of synch. Motor.

3. F.H.P. Motors

1. Classification of F.H.P. motors
2. Production of rotating Magnetic field in 1 ph. motors.
3. Double revolving field theory.
4. Construction working and application of
 - (i) Capacitor motor (all types)
 - (ii) Shaded pole motor
 - (iii) 1 ph. synchronous motor
 - (iv) 1 ph. series and universal motor
 - (v) Servo Motor

4. Electric Drives:

- (i) Advantages of electric drives.
- (ii) Characteristics of different mechanical loads.
- (iii) Types of motors used in electric drive.

- (iv) Use of fly wheels for fluctuating load (only physical concept).
- (v) Types of enclosures.
- (vi) Methods of power transfer by devices like belt drive, gears, pulley.
- (vii) Examples of selection of motors for particular loads.
- (viii) Applications such as general workshop, textile mill, paper mill, steel mill, Printing press, crane and lift.
- (ix) Specifications of commonly used motors (squirrel cage induction motors, Slipring induction motors, AC series motors).

5. Converting Apparatus: Introduction to different types of converting apparatus e.g. metal rectifier etc.

ELECTRICAL MACHINE II LAB

1. To determine performance characteristics of a polyphase induction motor. Load v/s efficiency, load v/s power factor, load v/s slip)
2. To start a 3 phase induction motor and to determine its slip at various loads.
3. To determine V curves of a synchronous motor.
4. To connect and start an induction motor by using star delta starter, auto transformer starter, rotor starter and to change its direction of rotation.
5. To perform open circuit and block rotor test on a 3 ph. induction motor and to Determine its efficiency.
6. Determination of performance curve and hence the core loss of a single phase series motor.
7. Voltage and current ratio of metal rectifier.
8. To perform open circuit and short circuit test on a 3 ph. synchronous machine and to determine synchronous impedance and regulation at lagging/leading power factor.
9. Sequential operation of motors using timers.
10. Achieving high starting torque in case of 3 phase slip ring motor by increasing external resistance in rotor circuits and determine speed regulation at different loads.

DEE-505 ELECTRIC TRACTION

1. Introduction:

Electric traction system and its advantages over other system, types of Electric traction systems. Traction systems for India.

2. Electric traction drives:

Suitability of electric traction drives- D.C. series motor, A.C. series motor, Phase induction motor, characteristics of electric traction drives, special Design requirements, methods of starting and speed control, different Methods of braking, plugging, rheostatic, regenerative.

3. Power supply of electric traction:

Different systems of power supplies, their chronological evolution, Power supply arrangement i.e. traction substation major equipment Transformer, circuit breaker, interrupter, protection system, Remote control system, design consideration.

4. Mechanics of traction

System of units, speed time curves, their construction, simplification and Interpretation for main line, suburban routes, tractive effort, specific Energy consumption and factors affecting it. Weight transfer due to torque Coefficient of adhesion.

5. Rectification Equipment

Equipments required for rectification their brief theory and working.

6. Over head Equipments

Design aspects of over head equipments centenary and its types, practical Aspects of working, maintenance of over head equipments, current Collection system, their requirements.

7. Track Circuits

D.C. and A.C. track circuits, signals for traffic control,

8. Supervisory Remote Control

System of remote control its advantages, mimic diagram, remote Control system and network remote control centre (R.C.C.)

9. Rail and Return Path

Earth returns protection of underground equipment, Negative booster, Voltage distribution on rails.

***Department of Electrical Engineering
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P.K. University, Shivpuri (MP)

III Year V Semester

DEE-506 INTEGRATIVE COMMUNICATION

PERSONALITY DEVELOPMENT

1. Introduction to Personality Development

AIM, Skills, Types of Skills, LIFE SKILLS VS OTHER SKILLS, Concept of Life Skills.

Ten core Life Skills identified by WHOM

2. Factors Influencing / Shaping Personality:

Introduction, Physical and Social Factors Influencing / Shaping Personality (Hereditary, Self-Development, Environment, Education, Life-situations) psychological & Philosophical Factors Influencing / Shaping Personality past Experiences, Dreams and Ambitions, Self-Image, Values)

3. Self Awareness – 1

DIMENSIONS OF SELF AWARENESS (Self Realization, Self Knowledge or Self Exploration, Self Confidence, Self Talk, Self Motivation, Self Esteem, Self Image, Self Control, Self Purpose, Individuality and Uniqueness, Personality, Values, Attitude, Character), self realization & self exploration through swot analysis and johari window,

4. Self Awareness – 2

SYMPATHY VS EMPATHY AND ALTRUISM, Importance of Empathizing with Others,

5. Self Awareness – 3

Self-Awareness through Activity, Body Image (What is Body Image, What Decides our Body Image, What is Poor Body Image, what are the Harmful Effects of Poor Body Image), Tackling Poor Body Image (Enhance Self-Esteem, Build up Critical Thinking, Build up Positive Qualities, Understand Cultural Variation, Dispel Myths, Utilize Life Skills)

6. Change Your Mind Set

What is Mindset, HOW TO CHANGE YOUR MINDSET (Get the Best? Information Only, Make the best people your role Model, Examine Your Current Beliefs, Shape Your Mindset with vision and Goals, Find Your Voice, Protect Your Mindset, Let Go of Comparisons, put an end to Perfectionism, Look at the Evidence, Redefine What Failure Means, Stop Worrying about What “People” Think)

INTERPERSONAL SKILLS

7. Interpersonal Relationship and Communication

Interpersonal relationship, forms of interpersonal relationship must have in an interpersonal relationship, interpersonal relationship between a man and a woman (passion, intimacy, commitment), relationship between friends,

Role of Communication in Interpersonal relationship (Take Care of Your Tone and Pitch, Choice of Words is Important in Relationships, Interact Regularly, Be Polite, Try To Understand The Other Person's Point Of View As Well as, Individuals can also communicate Through Emails,

8. Non-Verbal Communication Skills

Non-Verbal Communication, We Communicate with Our Eyes, Communication with Facial Expression, a Good Gesture, Appearance, Posture and Gait, Proximity & Touch),

IMPORTANCE OF LISTENING, Characteristics of Good and Effective Listener (Is Attentive, Do Not Assume, Listen for Feelings and Facts, Concentrate on the Other Speakers Kindly and Generously, Opportunities)

9. Communication Skills Activities

Activities in Making Collages, Making Advertisements, PPT Preparation & Presentation, Speaking -Seminars, Group Discussions, Debates, Extempore Speeches, Listening to an audio clip and telling its gist, Answering a Telephone call, making enquiries, General tips- Pronunciation, Tone, Pitch, Pace, Volume, relevance, brief, simple Reading Newspaper, Magazines (Current Affairs, Economic magazines, Technical magazines), How to read a Report, article, Writing- Resume Writing, Writing joining report, Notice Writing, Report making, Proposal writing, Advertisement, Notice for tender, Minutes writing, E-Mail writing, Listening News, Listening to audio clips.(Lecture, poetry, speech, songs),

10. Body Language Skills

Introduction, what is Body Language, Body Language Parts, Personal Space Distances (Intimate Distance, Personal Distance, Social Distance, Public Distance), IMPORTANT BODYLANGUAGE SIGNS AND THEIR MEANING

UNDERSTANDING OTHERS

11. Leadership Traits &Skills:

Introduction, Important Leadership Traits (Alertness, Bearing, Courage, Decisiveness, Dependability, Endurance, Enthusiasm, Initiative, Integrity, Judgment, Justice, Knowledge, Loyalty, Sense of Humor), Other Useful Traits (Truthfulness, Esprit-de-corps, Unselfishness, Humility and sympathy, Tact without loss of moral courage, Patience and a sense of urgency as appropriate, Self confidence, Maturity, Mental including emotional stability)

12. Attitude

Types of Attitude, Components of Attitudes (Cognitive Component, Affective Component, Behavioral Component), Types of Attitudes (Positive Attitude, Negative Attitude, Neutral Attitude, Rebellious Attitude, Rational and Irrational Attitudes, Individual and Social Attitudes), Kinds of Attitude, ASSERTIVENESS, How to Develop Assertiveness (Experiment and try New Things Extend Your Social Circle, Learn to Make Decisions for Yourself, Indulge in Knowledge, Admire Yourself &Others), Negotiation (Be Sensitive to the Needs Others, Be Willing To Compromise, Develop Your Problem-Solving Skills, Learn to Welcome Conflict, Practice Patience, Increase Your Tolerance for Stress, Improve Your Listening Skills, Learn to Identify Bottom-Line Issues Quickly, Be Assertive, not Aggressive)

PROBLM SOLVING

13. Analyzing & Solving a Problem skills

Critical Thinking, Creative Thinking, Decision Making, Goal Setting & Planning, Problem Solving

14. Time Management skills

Need of Time Management, TIME WASTERS (Telephone, Visitors, Paper Work, Lack of Planning & Fire Fighting, Socializing, Indecision, TV, Procrastination), PRINCIPLES OF TIME MANAGEMENT - Develop a Personal Sense of Time (Time Log , value of other people's time), Identify Long-Term Goals, Concentrate on High Return Activities, Weekly & Daily Planning (The Mechanics of Weekly Planning, Daily Planning), Make the Best Use of Your Best Time, Organize Office Work (Controlling Interruptions, Organizing Paper Work), Manage Meetings, Delegate Effectively, Make Use of Committed Time, Manage Your Health,

15. Stress Management Skills

INTRODUCTION, Understanding Stress and its Impact, Expected Responses (Physical, Emotional, Behavioral), stress signals (thoughts, feelings, Behaviors and physical), STRESSMANAGEMENT TECHNIQUES (Take Deep Breath, Talk It Out, Takea Break, Create a Quite Place in Your Mind, Pay Attention to Physical Comfort, Move, Take Care of Your Body, Laugh, Mange Your Time, Know Your Limits, Do You Have To Be Right Always, Have a Good Cry, Look for the Good Things around You, Talk Less, Listen More) UNDERSTANDING EMOTIONSAND FEELINGS-through Activity.

16. Interview Skills (2 sessions from Industry Expert is Compulsory)

Curriculum Vitae (When Should a CV be Used, What Information should a CV Include, personal profile, Covering Letter, What Makes a Good CV, How Long Should a CV Be, Tips on Presentation), Different Types of CV (Chronological, Skills-Based), before the interview, conducting yourself during the interview, following through after the interview, interview questions to think about, mock interview – activity (mock interview evaluation - non-verbal behaviors, Verbal behaviors, General Etiquettes to face the Board, Telephonic Interview

17. Conflict Motives –Resolution

Motives of Conflict (Competition for Limited Resources, the Generation Gap and Personality Clashes, Aggressive Personalities, Culturally Diverse Teams, Competing Work and Family Demands, Gender Based Harassment), Merits and Demerits of Conflict, Levels of Conflict (Interpersonal Conflict, Role Conflict, Inter-group Conflict, Multi-Party Conflict, International Conflict), Methods of Conflict Resolution (The Win-Lose Approach, The Lose-Lose Strategy, the Win-Win Approach), Techniques for Resolving Conflicts (Confrontation And Problem Solving Leading to Win-Win, Disarm the Opposition, Cognitive Restructuring, Appeal to Third Party, the Grievance Procedure)

18. Negotiation / Influencing Skills

Why influencing, what is influencing, types of influencing skills (probing and listening, building rapport, sign posting, pacing, selling, Assertiveness), laws and principles of influence, the six laws of Influence (the law of scarcity, the law of reciprocity, the law of authority, the law of liking, the law of social proof, the law of commitment and Consistency), influencing principles (making a start, buy yourself thinking time, Dealing with Disagreement, Difficult and Sensitive Situations)

19. Sociability: Etiquettes and Mannerism & Social Skills

Need for Etiquette, Types of Etiquettes (Social Etiquette, Bathroom Etiquette, Corporate Etiquette, Wedding Etiquette, Meeting Etiquette, Telephone Etiquette, Eating Etiquette, Business Etiquette, E-Mail Etiquettes,), mannerisms, how to improve your social skills (Be Yourself, Be Responsible, Be Open & Approachable, Be Attentive, Be Polite, Be Aware, Be Cautious)

20. Importance of Group / Cross Cultural Teams / Team Work skills

Introduction, Types and Characteristics of Groups (Definition of a Group, Classification / Types of Groups, Friendship Group, Task Group, Formal Groups, Informal Group, Effective Group), Importance of a Group, Characteristics of a Mature Group, TYPES AND CHARACTERISTICS OF A TEAM (Definition of team, Types of Teams, Functional Teams, Problem Solving Teams, Cross - Functional Teams, Self - Managed Teams), Importance of a Team, Characteristics of a Team

21. Values / Code of Ethics

Meaning, A FEW IMPORTANT VALUES (Honesty, Integrity, Purity, Discipline, Selflessness, Loyalty, Fairness, Equality, Trust, Support, Respect, Etc)

Note: One Orientation module for the faculty is must. Involvement of Industry Experts is necessary for Interview Skills

Department of Electrical Engineering

(Faculty of Engineering & Technology)

P.K. University, Shivpuri (MP)

III Year VI Semester

DEE- 601 ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT DETAILED CONTENTS

1. INTRODUCTION:

- Basics of ecology, Ecosystem, Biodiversity Human activities and its effect on ecology and eco system, different development i.e. irrigation, urbanization, road development and other engineering activities and their effects on Ecology and eco system, Mining and deforestation and their effects.
- Lowering of water level, Urbanization.
- Biodegradation and Biodegradability, composting, bio remediation, Microbes .
Use of biopesticides and biofungicides.
- Global warning concerns, Ozone layer depletion, Green house Effect, Acid Rain, etc.

2. POLLUTION:

Sources of pollution, natural and manmade, their effects on living environments and related legislation.

2.1 WATER POLLUTION:

- Factors contributing water pollution and their effect.
- Domestic waste water and industrial waste water. Heavy metals, microbes and Leaching metal.
- Physical, Chemical and Biological Characteristics of waste water.
- Indian Standards for quality of drinking water.
- Indian Standards for quality of treated waste water.
- Treatment methods of effluent (domestic waste water and industrial/ Mining waste water), its reuse/safe disposal.

2.2 AIR POLLUTION:

Definition of Air pollution, types of air pollutants i.e. SPM, NO_x, SO_x, CO, CO₂, NH₃, F, CL, causes and its effects on the environment.

- Monitoring and control of air pollutants, Control measures techniques.
Introductory Idea of control equipment in industries i.e.
 - A. Settling chambers
 - B. Cyclones
 - C. Scrubbers (Dry and Wet)
 - D. Multi Clones
 - E. Electro Static Precipitations
 - F. Bog Fillers.
- Ambient air quality measurement and their standards.
- Process and domestic emission control
- Vehicular Pollution and Its control with special emphasis of Euro-I, Euro-II, Euro-III and Euro IV.

2.3 NOISE POLLUTION:

Sources of noise pollution, its effect and control.

2.4 RADISACTIVEPOLLUTION:

Sources and its effect on human, animal, plant and material, means to control and preventive measures.

2.5 SOLID WASTE MANAGEMENT:

Municipal solid waste, biomedical waste, Industrial and Hazardous waste, Plastic waste and its management.

3. LEGISLATION:

Preliminary knowledge of the following Acts and rules made there under-

- The Water (Prevention and Control of Pollution) Act - 1974.
- The Air (Prevention and Control of Pollution) Act - 1981.
- The Environmental Protection (Prevention and Control of Pollution) Act -1986.

Rules notified under EPAct - 1986 Viz.

- # The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000
- # The Hazardous Wastes (Management and Handling) Amendment Rules, 2003
- # Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003.
- # The Noise Pollution (Regulation and Control) (Amendment) Rules, 2002.
- # Municipal Solid Wastes (Management and Handling) Rules, 2000.
- # The Recycled Plastics Manufacture and Usage (Amendment) rules, 2003.

4. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) :

- Basic concepts, objective and methodology of EIA.
- Objectives and requirement of Environmental Management System (ISO-14000) (An Introduction).

5. DISASTER MANAGEMENT:

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of tsunami Disaster, National policy- Its objective and main features, National environment Policy, Need for central intervention, State Disaster Authority-Duties and powers, Case studies of various Disaster in the country, Meaning and Benefit of vulnerability reduction, Factor promoting vulnerability reduction and Mitigation, Emergency support function plan. Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

Department of Electrical Engineering
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P.K. University, Shivpuri (MP)
III Year VI Semester

**DEE- 602 INSTALATION, MAINTENANCE AND REPAIR OF
ELECTRICMACHINES**

1. Scope and Organization of Electrical Maintenance Department:

Requirement of electrical maintenance department, organization of work of electrical m/c department, office work and record keeping of electrical Maintenance department, history & plant maintenance log book & job cards.

2. Installation and commissioning:

General guidelines for loading and unloading of heavy electrical machines. Brief Description of the accessories used for loading and unloading of heavy electrical Equipment. List of precautions to be taken while executing such jobs. Handling & transport of electrical machine, equipment & line accessoriest site. Installation of electrical equipment like induction motors, transformers, switch gears, Transmission and distribution lines etc. Alignment of the equipment, testing and Commissioning of different types of electrical equipment, transmission and distribution lines etc. Precautions while installation is in progress. Testing of installation before declaring it to be fit for energizing.

3. Preventive Maintenance of Electrical Equipment and other installations:

Meaning of preventive maintenance, advantages of programmed preventive maintenance, preparation of preventive maintenance schedule for transformers, Transmission lines, induction motors, circuit breakers, underground cables, Storage batteries etc.

4. Trouble Shooting:

Causes for failure of electrical equipments, classification of faults under

- (i) electrical,
- (ii) magnetic
- (iii) Mechanical, tool and instruments used for trouble shooting and repair.

Use of trouble shooting charts. Diagnosis of faults in

- (i) D.C.Machines
- (ii) Synchronous machines
- (iii) trans-formers,
- (iv) Induction motors,
- (v) Circuit breakers,
- (vi) Overhead& underground distribution lines
- (vii) Storage batteries
- (viii) Other appliances.

5. Earthing Arrangements.

Reasons for earthing of electrical equipment, earthing systems permissible earth Resistance for different types of installations, methods of improving the earth Resistance, measurement of earth resistance. System earthing and equipment Earthing.

6. Insulation Testing:

Classification of insulation as per ISS 1271/1958. Insulation resistance measurement, effect of temperature on resistance, reasons for determination of Insulation resistance, methods of improving insulation resistance, vacuum Impregnation, transformer oil testing and interpretation of the test results.

7. Electrical Accidents and Safety:

Classification of electrical accidents, statutory regulations (IS 5216-1969), Treatment for electric shock, artificial respiration, types and use of Different Types of fire extinguishers. Dangerous currents and voltages, effect of current on Human body Step and touch potentials, R.C.Ds. and earth leakage circuit breakers. General ideas about protection against lightning, explosive safety against static and current electricity, important Indian electricity rules.

Department of Electrical Engineering

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III Year VI Semester

DEE- 603 ELECTRICAL DESIGN DRAWING & ESTIMATING II

1. Principles of Estimating and Costing:

Purpose of estimating and costing, essentials of estimating and costing-market Survey, price list and net prices, preparation of list of materials, calculation of Material and labor cost, contingencies, overhead charges, profit and total cost, Quotations-comparative statement and orders, idea about tender forms. Use of E.S.R (state PWD and CPWD)

2. Earthing:

Need for earthing of electrical installations, advantages and disadvantages, effect of improper earthing, I.S. specifications regarding earthing of electrical Installations, points to be earthed as per I.E. rules. Methods of earthing-plate and Pipe earthing. Determination of size of earth wires and earth plates for different Capacities of electrical installations, specification of earthing materials and their Cost, Earthing of power plant and grid substation.

3. Estimation of Internal Wiring Installation:

Estimation of wiring installation for commercial and industrial buildings such as Multi-storied hotels, hospitals, schools, colleges, cinema community centers, Public library, high rise residential buildings etc including design of layout, load Estimation, Demand factor and diversity factor, power distribution scheme, list of material with specifications, estimation of cost preparing relevant electrical Schedule of rate (CPWD or PWD) using latest practices, materials and accessories.

4. Estimation of Power Wiring

I.S. specifications and I.E. rules, calculation of current for single and three phase Motors. Determination of sizes of cables, conductor's distribution board, main Switches and starters for power circuits. Cost of equipments and accessories and Schedule of materials. Estimation and cost of material and work for motors up to 20 H.P. pump sets and small workshops.

5. Estimation of Overhead and Underground Distribution Lines:

Main components of overhead lines-line support, cross-arm, Clamps, conductors and stay sets, lightning arrestors, Danger plates, ant climbing devices, bird guards, Jumpers etc., concreting of poles, earthing of transmission line, formation of lines, Specification of materials for O.H.lines, I.S. specification and I.E. rules. Cost of material and work for overhead and underground lines up to 11 KV only.

6. Estimation of Service Connections:

Service connection, types of service connections-overhead and underground for Single story and double story buildings, estimate of materials required for giving Service connection to domestic consumers, commercial consumers and industrial Consumers at L.T. and H.T. costing of material and work in above cases.

7. Estimation of Small Sub-Station

Main equipments and auxiliaries installed on the substation. Estimation of materials required for a small distribution substation (indoor and outdoor type-Platform and pole mounted). Costing of material and work of above substations.

DRAWING WORK:-

- | | |
|---|----------|
| 1. Earthing | 1 sheet |
| 2. Commercial and industrial buildings | 2 sheets |
| 3. Power wiring layout and circuits | 2 sheets |
| 4. Stays, line crossings, line earthing, end Poles and terminal poles, junction poles towers and transposition pole/towers. | 2 sheets |
| 5. Service connection domestic, industrial and Agriculture. | 2 sheets |
| 6. Substation layout and bus bar arrangements | 2 sheets |
| 7. Machine drawings-induction and synchronous machines. | 2 sheets |
| 8. Winding of induction machine, 3 ph; 1 ph. | 2 sheets |
| 9. Reading and interpreting practical Drawing of wiring installation and control Circuits. | |
| 10. Winding of synchronous machine 3 ph. (Alternator and synchronous motor) | 2 sheet |

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DEE- 604 UTILISATION OF ELECTRICAL ENERGY

1. Illumination:

- (i) Nature of light, curve of relative sensitivity of human eye and wave length.
- (ii) Definitions: flux, solid angle luminous intensity, illumination, luminous efficiency, depreciation factor coefficient of utilization, space to height ratio, reflection factor, laws of illumination.
- (iv) Calculation of number of light points for interior illumination; calculation of illumination at different points; considerations, involved in simple design problems and illumination schemes; levels of illumination. Methods To increase illumination efficiency
- (v) Different sources of light: Difference in incandescent and discharge lamps - their construction & characteristics, fittings required for filament lamp, mercury lamp, fluorescent lamp sodium lamp, neon lamp.
- (vi) Main requirements of proper lighting; illumination level, absence of glare, Contrast and shadow.

2. Electric Heating;

- (i) Introduction.
- (ii) Advantages of electrical heating.
- (iii) Heating methods:
 - (a) Resistance heating (direct resistance heating, indirect resistance heating, Electric ovens, their temperature range) salt bath heaters properties of heating elements, domestic water heaters and other heating appliances.
 - (b) Induction heating, principle, core type and coreless induction furnace.
 - (c) Electric arc heating, direct and indirect arc heating, arc furnace.
 - (d) Dielectric heating. Applications in various industrial fields, microwave Ovens.
 - (v) Simple design problems of resistance heating element.

3. Electric Cooling

- (i) Concept of refrigeration and air-conditioning.
- (ii) Brief description of vapour compression refrigeration cycle.
- (iii) Description of electrical circuit used in
 - (a) Refrigerator,
 - (b) Air conditioner, and
 - (c) Water cooler.

4. Electric Welding:

- (i) Welding methods, principles of resistance welding, welding equipment.
- (ii) Electric arc welding principle, characteristics of arc; carbon and metallic arc Welding, power supply, advantage of coated electrode, comparison of AC and DC arc welding; welding equipment.

5. Electrochemical Processes:

- (i) Need of electro-deposition.
- (ii) Faraday's laws in electrode position.
- (iii) Objectives of electroplating.

- (iv) Description of process for electroplating.
- (v) Factors governing electro deposition.
- (vi) Equipments and accessories for electroplating plant.
- (vii) Principle of anodizing and its applications.
- (viii) Electroplating on non-conducting materials.

6. Electric Traction:

- (i) Concept and configuration of Electric drive and types of electric drive.
- (ii) Advantage of electric traction.
- (iii) Different systems of electric traction, D.C. and A.C. system.
- (iii) Different accessories for track electrification; such as overhead wires, Conductor rail system, current collector-pantograph.
- (vii) Electrical block diagram of an electric locomotive with description of various equipments and accessories.
- (vi) Electric braking, plugging, rheostatic and regenerative braking.
- (viii) Different types of battery driven vehicles and their application.

7. Economic Consideration

7(a) Load estimation, load curves, load duration curve, demand factor, load Factor, diversity factor, Plant capacity factor, and utilization factor, simple Problems involving interpretation and application of above factors.

7(b) Cost of generation, fixed cost, running cost, cost per unit, effect of load and Diversity factor on overall cost of generation. Economic load division between power stations for a given load duration curve.

7(c) Tariffs: meaning of different tariffs and their application, block rate, flat Rate, max. Demand and two part tariffs. Bill preparation.

8. ENERGY CONSERVATION:

Need for energy conservation, over view of energy management, Basic Idea about energy audit.

Department of Electrical Engineering
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DEE-605 PROJECT

Introduction:

The project work is grouped under following three heads. A number of projects have been mentioned under each head (i.e. group). A student should take at least two projects, both of which should not be from the same group.

DETAILED CONTENTS

1. Developmental Projects:

Students are expected to design the item identify the material and the manufacturing process, prepare one prototype and test it for its satisfactory operation. The report of such projects should be written as per requirement lay down by state. Department of industries may consider for sanctioning of loan and other subsidies for entrepreneurs. It should include feasibility report, costing, sales strategy, monetary requirements, design, manufacturing process, materials and testing.

2. Fabrication Projects:

Under these projects, students will fabricate the item or set up facilities for Carrying out specific job. The report will include basic principles and concepts used in describing the working of the item/activity, specification of materials being used, detailed description of manufacturing process and specifications of machine tools used, testing procedure and test report, total cost of the item etc.

3. Estimating and Costing Projects:

Under such projects students will prepare an estimate of providing Electrical installations in the given building using standard norms and practices. The report should include: assumptions; designing of electrical layout, layout Plan, detailed circuit diagram, list of material required and their specification, cost estimation, testing procedure etc. The project report should be prepared on the pattern it is prepared by state electricity board/PWD for similar jobs.

NOTE: It is pointed out that the projects mentioned under each group are some Suggestions only. Teachers may choose other similar projects under each group and get them approved by a committee headed by the Head of Electrical Engineering Department.

1. DEVELOPMENT PROJECTS:

- 1.1 Small transformers (up to 250 VA)
- 1.2 Tube light chokes (40 W)
- 1.3 Automatic star-delta starter
- 1.4 Fan regulators (choke type)
- 1.5 Fan regulator (resistance type)
- 1.6 Desert cooler (using standard fan and pump)
- 1.7 Storage water heaters (geysers) 25 Lt.

- 1.8 Air blower type room heater (2 Kw)
- 1.9 Electroplating unit (nickel, chromium)
- 1.10 Repair and maintenance shop for domestic gadgets.
- 1.11 Voltage stabilizers for refrigerators (.5 Kw)
- 1.12 Emergency light
- 1.13 Thyristor control of electric motor.

2. FABRICATION PROJECTS:

- 2.1 Phase sequence indicator.
- 2.2 Inductive loading choke, 5 Kw, 230 V.
- 2.3 Automatic curtain operator for a stage
- 2.4 Automatic water level controller for an overhead Tank
- 2.5 Rewinding of variac
- 2.6 Rewinding of FHP motor
- 2.7 Rewinding of ceiling/exhaust fan.
- 2.8 Rewinding of refrigerator motor (hermetically sealed)
- 2.9 Low cast intercom for home
- 2.10 Regulated power supply
- 2.11 Solid state fan regulator
- 2.12 Automatic battery charger
- 2.13 Burglar alarm
- 2.14 Hearing aid
- 2.15 Automatic street light controller (On/OFF only)
- 2.16 Inverter circuit (500 W)
- 2.17 Digital clock
- 2.18 2-band radio receivers (transistorized)
- 2.19 Stereo amplifier
- 2.20 Electronic door bell (cordless)
- 2.21 Light dimmer
- 2.22 Automatic control of water pump using timer
- 2.23 Object counter
- 2.24 Musical door bell with IN-OUT indication
- 2.25 Battery eliminator
- 2.26 Erection of overhead distribution over a small distance.

3. ESTIMATING AND COSTING PROJECTS

- 3.1 Electrical installation in a domestic building including service mains, and Earthing.
- 3.2 Electrical installation in a small workshop including power wiring.
- 3.3 To provide distribution system through underground cable in a residential Colony.
- 3.4 5KVA, 3 phase, 11 KV/.415 V pole mounted substation for a farm house.
- 3.5 Electrical installation in a public building such as school, hospital, Community centre, cinema, library auditorium, club, dispensary, polytechnic etc.
- 3.6 Electrical installations in a high building.
- 3.7 Electrical installations in a small govt. colony comprising of different Category of houses.
- 3.8 33 KV/.415 V, 3 ph, 1000 KVA, indoor substation for abulk consumer.