

Kalinga University Atal Nagar (C.G.)



**SCHEME OF EXAMINATION
& SYLLABUS**

of

Diploma in Electrical Engineering

UNDER

FACULTY OF ENGINEERING & TECHNOLOGY

w.e.f. Session 2021-22

Kalinga University, Raipur
Diploma in Electrical Engg. (3 yrs Programme)
w.e.f 2021-22 Session

SEMESTER -I						
Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DIEE101	Communication Skills - I	3	70		30	100
DIEE102	Applied Mathematics-I	3	70		30	100
DIEE103	Applied Physics –I	3+1	70	50	30	150
DIEE104	Applied Chemistry -I	3+1	70	50	30	150
DIEE105	Engineering Drawing -I	3+1	70	50	30	150
DIEE106	Computer Fundamentals and Applications	2+1	50	50		100
DIEE107	Workshop Practice -I	1		50		50
	Total	22	400	250	150	800
Semester - II						
Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DIEE201	Communication skills – II	3	70		30	100
DIEE202	Applied Maths-II	3	70		30	100
DIEE203	Applied Physics -II	3+1	70	50	30	150
DIEE204	Applied Chemistry -II	3+1	70	50	30	150
DIEE205	Basic Electrical Engineering	3+1	70	50	30	150
DIEE206	Engineering Drawing-II	3+1	70	50	30	150
	Total	22	420	200	180	800

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Semester - III

Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DIEE301	Electrical & Electronics Engg Material	3+1	70	50	30	150
DIEE302	Fundamental of Electrical Engg	3+1	70	50	30	150
DIEE303	Basic Electronics	3+1	70	50	30	150
DIEE304	Electrical Engg Design & Drawing-I	3+1	70	50	30	150
DIEE305	Computer Programming & Application	3+1	70	50	30	150
DIEE306	Electrical Workshop Practice-I	1		50		50
	Total	21	350	300	150	800

Semester - IV

Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DIEE401	Electrical Machine-I	3+1	70	50	30	150
DIEE402	Electrical Measurements and Measuring Instruments	3+1	70	50	30	150
DIEE403	Electronics Devices & Circuits	3+1	70	50	30	150
DIEE404	Electrical Engg Design & Drawing-II	3+1	70	50	30	150
DIEE405	Estimating & Costing in Electrical Engg	3+1	70	50	30	150
DIEE406	Electrical Workshop Practice-II	1		50		50
	Total	21	350	300	150	800

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Semester - V						
Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DIEE501	Electrical Machines -II	3+1	70	50	30	150
DIEE502	Power-I	3	70		30	100
DIEE503	Industrial Electronics & Control of Drives	3+1	70	50	30	150
DIEE504	PC Maintenance & Repair	3	70		30	100
DIEE505	Digital Electronics & Microprocessor	3+1	70	50	30	150
DIEE506P	Industrial Training	2				150
	Total	20	350	150	150	800
Semester - VI						
Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DIEE601	Utilization of Electrical Energy	3	70		30	100
DIEE602	Installation of Maintenance of Electrical equipment	3+1	70	50	30	150
DIEE603	Power-II	3+1	70	50	30	150
DIEE604	Energy Management	3+1	70	50	30	150
DIEE605	Entrepreneurship Development & Management	3	70		30	100
DIEE606	Major Project Work	6	100		50	150
	Total	24	450	150	200	800

R A I P U R

SEMESTER-I



RAIPUR

COMMUNICATION SKILL-I

UNIT-I

Passage for Comprehension:-

- (1) Language of Science
- (2) Robotic Revolution
- (3) Designing a Car
- (4) New Wonders of camera
- (5) Non-conventional sources of Energy
- (6) Our Environment
- (7) Entrepreneurship
- (8) Safety practices

UNIT-II

Short-Stories :-

- (1) Selfish Giant-Oscar Wilde
- (2) A Letter to God-Gregario Lapex Y-Fuentes An astrologer's Day –R.K. Naragyan

UNIT-III

Applied Grammar :-

- (1) Determiners
- (2) Auxiliaries
- (3) Tenses
- (4) Passive
- (5) Prepositions
- (6) Subject-verb Agreement

UNIT-IV

Letter Writing:-

- (1) Application (For Job/Leave)
- (2) Letter of Enquiry and replies
- (3) Letter for Order Placement
- (4) Letter of Complaints (To Editor/ Appropriate Authorities)

UNIT-V

Report Writing :-

- (1) Writing Progress – Report of a job
- (2) General outline for preparing A Project Report.

Reference Books

1. Communication Skill for Teaching Students Book-I. M/s Somalia Publications. Pvt. Ltd., Bhopal.
2. Living English Structure –W.S. Allen
3. Practical English Grammar (Exercises I by Thomson & Martinet)
4. English conversation practice by Grant Taylor.

APPLIED MATHEMATICS-I

UNIT-I

Algebra-

Determinants and Matrices-expansion

Determinants and Matrices-expansion of determinants(upto third order)using sarrus Rank, expansion method and pivotal condensation method. Properties of determinants ,solutions of equations (up to 3 unknowns)by Cramers's rule. Definition of matrix, addition, subtraction and multiplication of matrices(up to third order).inverse of a matrix by Adjoint method and elementary row transformations. Solution of equations(up to 3 unknowns)by Matrix method

UNIT-II

Logarithm

general properties of logarithms

Partial fractions

(linear factors, repeated linear factors ,non reducible quadratic factors)

To resolve proper fraction into partial fraction with denominator containing non repeated linear factors to resolve improper fraction into partial fraction

UNIT-III

Trigonometry

Trigonometric ratios of any angle relation between degree and radian

Fundamental identities examples based on fundamental identities factorization

And defactorization formulae inverse trigonometric ratios value of inverse trigonometric ratios

UNIT-IV

Vectors

Definition of vector and scalar quantities. addition and subtraction of vectors. Dot product and cross product of two vectors. Thumb rule, Angle between two vectors, application of dot and cross product in engineering problems

Circle

Equation of circle in standard form centre radius form diameter form

General equation of circle

UNIT-V

Complex Numbers

Definition, Real and Imaginary parts of a complex number, polar and Cartesian representation of a complex number and conversion from one to the other, conjugate of a complex number, modules and argument of a complex number.

Reference Books:-

- Mathematics for Polytechnic Volume I, TTTI Publication
- Applied Mathematics, EEB Publication , Bhopal
- Differential Calculus, By Gorakh Prasad
- Integral Calculus, By Gorakh Prasad
- Coordinate Geometry, By. S.L. Loney

APPLIED PHYSICS-I

UNIT-I Units and Dimensions: Physical quantities, Fundamental and derived units, Systems of units (FPS, CGS, MKS and SI units), Dimensions and Dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, coefficient of viscosity and strain) Principle of homogeneity, Dimensional equations and their applications, conversion from one unit to another unit for density, force, pressure, work, power, energy, velocity, acceleration, Limitations of Dimensional analysis

UNIT-II

Force and Motion: Scalar and vector quantities – examples, addition and multiplication (scalar product and vector product) of vectors. Force, resolution and composition of forces – resultant, parallelogram law of forces. Equilibrium of forces, Lami's theorem. Newton's Laws of motion – concept of momentum, Newton's laws of motion and their applications, determination of force equation from Newton's second law of motion; Newton's third law of motion conversion of momentum, impulse and impulsive forces, simple numerical problems based on third law. Projectile, horizontal and oblique projections and equation of trajectory. Derivation of time of flight, maximum height and horizontal range, Circular motion, Relation between linear and angular velocity and linear acceleration and angular acceleration, Centripetal force (derivation) and centrifugal force, Banking of roads

UNIT-III

Work, Power and Energy: Work: definitions and its SI units, Work done in moving an object on horizontal and inclined plane (incorporating frictional forces). Power: definitions and its SI units, calculation of power in simple cases. Energy: Definitions and its SI units: Types: Kinetic energy and Potential energy, with examples and their derivation, Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another

Properties of Matter: Elasticity, definition of stress and strain, Different types of modulus of elasticity. Explanation of stress – strain diagram. Pressure – its units, gauge pressure, absolute pressure, atmospheric pressure, Bourdon's pressure, manometers and barometer gauges. Surface tension – its units, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension. Fluid motion, stream line and turbulent flow, Reynolds number. Viscosity and coefficient of viscosity; derivation of terminal velocity; effect of temperature on viscosity.

UNIT-IV

Waves and vibrations: Generation of waves by vibrating particles, Wave motion with examples, Types of wave motion, transverse and longitudinal wave motion with examples. Velocity, frequency and wave length of a wave (relationship $v = \eta\lambda$). Sound and Light waves. Simple harmonic motion: definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M. Vibration of cantilever and beam, determination of time period of a cantilever. Free, forced and resonant vibrations with examples

Rotational Motion: Definitions of torque, moment of inertia, radius of gyration, Derivation of rotational kinetic energy and angular momentum, Conservation of angular momentum (qualitative). Theorems of

parallel and perpendicular axes

Gravitation and satellites: Kepler's law of planetary motion, Newton's law of gravitation, Escape velocity (derivation), Satellites, Geo-stationary satellite

UNIT-V

Temperature and its measurement: Principles of measurement of temperature and different scales of temperature, Difference between heat and temperature on the basis of K.E. of molecules, Bimetallic and Platinum resistance thermometer: their merits and demerits, Pyrometers – Disappearing filament optical pyrometer

Transfer of Heat: Modes of transfer of heat (conduction, convection and radiation with examples) Coefficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle's method) and bad conductor (Lee's disc method), Properties of heat radiation, Stefan's law, Kirchhoff's law, Wien's law, Planck's black body radiation law, Prevost's theory of heat exchange

LIST OF PRACTICALS

1. To find the thickness of wire using a screw gauge
2. To find volume of solid cylinder and hollow cylinder using a vernier caliper
3. To determine the thickness of glass strip and radius of curvature of a concave surface using a spherometer
4. To find the surface tension of a liquid by capillary rise method
5. To determine and verify the time period of cantilever by drawing graph between load (w) and depression (D)
6. To determine the atmospheric pressure at a place using Fortin's Barometer
7. To determine the coefficient of linear expansion of a metal rod
8. To find the coefficient of thermal conductivity of copper using Searle's conductivity apparatus

To find the coefficient of thermal conductivity of bakelite sheet (bad conductor) by Lee's Disc Method

RECOMMENDED BOOKS

1. Applied Physics Vol. I, TTTI Publication Tata McGraw Hill, Delhi
2. Basic Applied Physics by RK Gaur; Dhanpat Rai Publications
3. Comprehensive Practical Physics - Volume I and II by JN Jaiswal; Laxmi Publishers
4. Numerical Problems in Physics - Volume I and II by RS Bharaj; Tata McGraw Hill
5. Simple Course in Electricity and Magnetism by CL Arora; S Chand and Co, New Delhi
6. Fundamental Physics - Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
7. A Text Book of Optics by Subramanian and Brij Lal
8. Physics Laboratory Manual by PK Palanisamy, Scitech Publications
9. Fundamentals of Physics by Resnick and Halliday, Asian Books Pvt. Ltd., New Delhi
10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi
11. Applied Physics Vol. I&II H.C. Saxena & Prabhakar Singh
12. Applied Physics Vol. I&II D.Halliday & R.Rasnick
13. Engineering Physics – BVN Rao
14. Principles of Physics – K.K. Mohindroo
15. Basic Principles of Physics – Brij Lal Subramanyam .

APPLIED CHEMISTRY-I

UNIT-I

Language of Chemistry: Definition of symbol, formula, valency and chemical equation. Writing of the chemical formula of a simple chemical compound. Calculation of percentage composition of a chemical compound, Essentials of a chemical equation, balancing of a chemical equation by Hit and Trial method.

UNIT-II

Chemical Bonding: Electronic concept of valency, Elementary account of electrovalent, covalent and coordinate bond formation on the basis of the electronic concept of valency with the help of suitable examples to each

UNIT-III

Water: Hard and soft water, types of hardness and its causes, disadvantages of hardness of water (i) in industrial use (ii) in boilers for steam generation. Methods to remove hardness of water (i) Clark's Process (ii) Permutit Process (iii) Soda Lime process (iv) Ion-Exchange process. Simple numerical problems related to soda lime process. Definition of degree of hardness of water and the systems to express the degree of hardness of water. Simple numerical problems related to finding the degree of hardness on different scales. Qualities of water used for drinking purposes, treatment of river water to make it fit for town supply

UNIT-IV

Solutions: Concept of homogenous solution, brief introduction of the terms (i) Ionization (ii) Acidity (iii) Basicity (iv) equivalent weight and gram equivalent weight with suitable examples Strength of a solution (i) Normality (ii) Molarity (iii) Molarity as applied in relation to a solution. Simple numerical problems related to volumetric analysis, Definition of pH, and different industrial applications of pH

UNIT-V

Electrolysis: Definition of the terms: Electrolytes, Non-electrolytes conductors and non-conductors with suitable examples. Faraday's Laws of Electrolysis. Simple numerical problems based upon the laws of electrolysis, Different industrial applications of 'Electrolysis'. Elementary account of (i) lead acid battery and (ii) Ni-Cd battery with special reference to their reaction mechanisms.

LIST OF PRACTICALS

1. Volumetric analysis and study of apparatus used therein. Simple problems on volumetric analysis equation
2. Preparation of standard solution of oxalic acid or potassium dichromate
3. Determine the strength of a given solution of sodium hydroxide with the help of a standard solution of oxalic acid
4. Determine the strength of solution of HCl with the help of a solution of NaOH and an intermediate solution of standard oxalic acid
5. Find the amount of chlorides in mg per liter in a sample of H₂O with the help of a solution of AgNO₃
6. Determine the degree of temporary hardness of water by O' Hehner's method
7. Estimate the amount of Cu in a sample of CuSO₄ using a standard solution of Na₂S₂O₃

8. Estimation of amount of iron in hematite ore volumetrically
9. Estimation of total alkalinity of water volumetrically
10. Determine conductance, pH of water sample using conductance bridge and pH meter

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40
3. "A Text Book of Applied Chemistry-I" by SS Kumar; Tata McGraw Hill, Delhi
4. "A Text Book of Applied Chemistry-I" by Sharma and Others; Technical Bureau of India, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M
6. Chemistry of Engineering by Aggarwal CV
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar
9. Engineering Chemistry by O. P. Agrawal.
10. Physical Chemistry by Glosstone.
11. Organic Chemistry by Sarkar and Rakshit.
12. Engineering Chemistry by M. M. Uppal Revised by S. C. Bhatia.
13. Modern Text Book of Applied Chemistry by P.C. Jain, Dr. G. C. Saxena and Dr.A. K. Goswami.



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ENGINEERING DRAWING-I

UNIT-I

1. Introduction

- Introduction to drawing equipments, instruments and their uses
- Planning of drawing sheet as per I.S. 696 – 1972
- Indian standard practices of laying out and folding of drawing
- Different types of lines used in engineering drawing
- Standard practice for writing single stroke vertical and inclined capital and lower cases letters (practice to be done on sketch book)
- Standard practice of writing numerals (practice to be done on sketch book)

2. Dimensioning techniques and standard conventions

- Identification and representation of various symbols used in Mechanical and Electrical Drawing
- Drawing Identification and representation of various symbols of building elements, materials and sanitary fittings
- Principles, system and arrangement of Dimensioning
- Practice problems of current method of Dimensioning
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UNIT-II

1. Form associated with engineering curves

- Types of engineering curves
- Method of construction of Engineering Curves
- Practice problems of drawing various Engineering Curves.
- Importance of scale in Engineering drawing
- Types of scales- plain, diagonal etc.
- Practical problems for constructing various types of scale.

2. Orthographic projection of points, lines and planes

- Definitions of various terms associated with orthographic projections.
- Planes of projections
- Concept of Quadrants
- First and third angle method of projection
- Projection of line in different positions with respects to H.P. V.P. and X-Y line
- Projection of planes in different position with respect to reference planes
- Practice problems on projection of points, lines and planes.

UNIT-III

1. Projections of simple machine parts and components

- Procedure for drawing projections and sectional views of simple machine components
- Practice problems of sketching and drawing the projections and sections of simple machine components.

2. Projections of solids

- Types of solids and associated terminology
- Position of solid with respect to reference planes
- Drawing projections of solid in different position with respect to reference planes
- Practice problems to draw projections of solid in different positions.

UNIT-IV

1. Section of solids

- Concept of sectioning planes
- Auxiliary planes and true shape of section
- Practice problems for drawing projections and section of solids.

2. Development of surfaces

- Concept and importance of surface development in engineering field
- Development of surfaces for the following
- Cube
- Cylinder
- Prism
- Cone and Frustum cone
- Practice problems.

UNIT-V

1. Isometric projections 8

- Limitations of orthographic projections
- Definitions of the terms axonometric, oblique, Isometric and diametric projections
- Procedure for preparing isometric oblique
- Isometric view of geometrical solids and simple machine parts
- Practice problems.

2. Basics of CAD

- Computer hardware and software requirement for CAD
- Co-ordinate systems
- Set up for a CAD drawing
- Drawing objects like- Line, Circle, Arc, Ellipse, Regular Polygons, Polylines, Donuts etc.
- Editing Commands like- Move, Copy, Rotate, Scale, Fillet, Chamfer, Trim, Extend, Array, Mirror etc.
- Basic Dimensioning, geometric Dimensioning and tolerance
- Use CAD commands for simple orthographic and isometric drawings

Instructional Strategies

- Lecture Method
- Demonstration and use of instrument used in drawing.
- Classroom practices for different typical exercises.
- Use of computer for developing drawing
- OHP Transparencies for complicated drawing objects

List of Practicals

- Problems on Scales and Letterings (One sheet)
- Problems on Curves (One sheet)
- Simple Orthographic Projections- One for First Angle and One for Third Angle Projection (Two sheets)
- Orthographic projections with sections (One sheet)
- Isometric projection for two objects (One sheet)
- Projection of Points and Lines (One sheet)
- Projection of Planes (One sheet)
- Projection of Solids (Two sheets)
- Section of Solids (Two sheets)
- Development of surface (Two sheets)
- Use CAD for orthographic projection (Five problems)
- Use CAD for isometric projection (Three problems)

Reference Books

1. I.S. 696. (Latest revision), BIS, India
2. Engineering Drawing, N.D. Bhatt, Charoter Publisher, Anand
3. Engineering Drawing & Machine Drawing, R. K. Dhawan, Kumar
4. Engineering Drawing , R.B. Gupta, Satya Prakashan, Delhi
5. Geometrical Drawing , P.S. Gill , ketson & Sons

RAIPUR

Computer Fundamentals and Applications

UNIT-I

1. INTRODUCTION TO COMPUTERS

Generations Of Computer-

-First, Second, Third and Fourth generation.

Classification & applications of computers-

- Micro, Mini, Mainframes and Super-Computers.
- Applications of computers.

2. MICROCOMPUTER

Structure & Working Of Micro Computers

- Central Processing Unit.
- Memory Unit.
- Input & Output Devices.

Evolution Of Micro-Computers

- Comparative study w.r.t. Micro-processor, clock speed, data bus, Register size, storage capacity, peripheral interface of PC to Pentium-IV computer systems.

UNIT-II

1. DATA REPRESENTATION

Data Representation

-Bit, byte, Nibble, Word, Double word Codes: ASCII, Binary Coded Decimal (BCD) EBCDIC, GREY and EXCESS 3 code

.Number Systems

-Types of number systems-Binary, Octal, Decimal, Hexadecimal.

Conversions Of Number Systems And Its Operations

-Binary addition, subtraction
.-BCD addition, subtraction.
-1's complement and 2's complement methods of subtraction Floating point arithmetic.

UNIT-III

1. COMPUTER LANGUAGES

Classification And Characteristics Of Languages

-Machine language.
-Assembly language.
-High level language.
-Hardware, Software And Firmware Computer Hardware Classification Of Software

2. INTRODUCTION TO DOS OPERATING SYSTEMS

- **Micro-Soft Disk Operating System (Ms-Dos)**
-System files: BIOS, COMMAND.COM, CONFIG.SYS, Autoexec.bat file.
- **MS-DOS Commands**

-Internal Commands – dir, cd, md, rd, del, ren, date, time, vol.

And copy External commands– attrib, format, edit, find, diskcopy, backup & restore.

UNIT-IV

1. INTRODUCTION TO WINDOWS OPERATING SYSTEMS

Windows Operating System

-Concept of Windows-Arranging, Moving, Resizing, Opening, and Closing of windows

.-Folder/File Management-Search, copy, delete and rename files and folders Windows

Accessories: Notepad, Word Pad, Pad.

2. COMPUTER APPLICATIONS SOFTWARE.

- **Word Processing Software**

MS Word

- **Data Analysis Software**

MS Excel Introduction to Electronic Spreadsheet.

- **Presentation Software**

MS Power Point

UNIT-V

1. INTERNET APPLICATIONS

Introduction To Internet -Different Services Of Internet

-www

-Email

-Chat (textual/voice)

-Bulletin Boards

-Video conferencing

-FTP (uploading and downloading files)

WEB-SITE ACCESS AND INFORMATION SEARCH

-Browsers and search engines.

2. INTERNET CONNECTIVITY

Internet Connectivity

-Internet Service Provider (ISP)

-Internet accounts : Shell account, TCP/IP ISDN and Leased Line

-Account and its features.

Hardware Required

-MODEM and Terminal Adapters.

-System software: O.S. Loader, Linker, Interpreter, Compiler and Assembler Application Software.

List of Experiments/Demonstrations/Tutorials

- Study Of Input And Output Devices
- Study Of Storage Devices
- Practice On Internal And External Ms-Dos Commands
- Practice On Windows 95/98/2000

Starting Windows, Exploring the desktop, Arranging windows, My Computer, The start button, Creating

Shortcuts, Practice on moving and sizing of windows.
Study of file organization: creating, copying, moving, renaming and deleting. -Practice on Windows Accessories – Notepad, Word Pad and Paint. Editing document & formatting text, Previewing and printing document/Image file. -Practice on Windows Explorer.
Recycle bin, Shutting down windows.

PRACTICE ON MS-WORD

Create and format document ,
Edit and Modify text-changing font size type and style.
Auto Text, AutoComplete, AutoCorrect, grammar and spellchecker, Find and replace of text.
Open save and print a document.
Insert, modify table.

PRACTICE ON MICROSOFT EXCEL

Create, save & format worksheet
Open and save worksheet file.
Edit & modify data.
Use formula and functions.
Split windows and freeze pans.
Create, edit, modify, print worksheet/charts.

PRACTICE ON POWERPOINT

Create, edit, insert, move, slides.
Open and save presentation.
Insert picture, slide layout, action button.
Present slide show.

PRACTICE ON INTERNET

Identification of type of Account. Connecting to internet.
Dial up access
Web browsing
Searching websites
Email services
Creating email accounts & Receiving and sending mails

Reference Books

1. Introduction to Computers, Iind Edition 1998 , Peter Norton's Tata McGraw Hills Publishing
2. The ABCs of Ms-Office 97 , Ist Edition, Gay Hart Davis
3. Computer Organization and architecture, IVth – Edition 1996 , William Stalling
4. Structured computer Organization , III rd – Edition 1997 , Andrews Tanenbaum Prentice Hall of India Pvt. Ltd, N. Delhi
5. Teach yourself..... windows 95, I st – Edition 1995 , A L Stevens Comer BPB Publication, N. Delhi
6. The Internet Book , II – Edition 200, Douglas E. Prentice Hall of India Pvt. Ltd, N. Delhi

WORKSHOP PRACTICE -I

1 Measurement, Identification and use of the various measuring tools & instruments.

- Linear measurements and measuring devices.
- Angular measurements and measuring devices
- Other measuring tools such as surface plate, Surface gauge, plate Safety in different shop of workshops.

2. Wood working (carpentry shop)

- 2.1 Identification of carpentry tools and their uses.
- 2.2 Perform various wood working operations.

3. Fitting shop.

3. 1 Identification of various tools used and the operations performed in fitting shop.

3.1.1 Perform various fitting operations.

3.1.2 Marking of job as per DIEEnsior.

3.1.3 Sawing.

3.1.4 Chipping .

3.1.5 Filling .

3.1.6 Taping .

3.1.7 Reaming.

3.1.8 Drilling.

3.2 Smithy Shop

3.2.1 identification of various tools and equipments used & their use.

3.2.2 Perform Various smithy operations.

3.2.3 Up setting .

3.2.4 Drawing down.

3.2.5 Bending

3.2.6 Setting down.

3.2.7 Welding.

3.2.8 Cutting .

3.2.9 Punching.

3.2.10 Fullering.

4. Sheet metal.

4.3.1 Identification and use of the various tools.

4.3.2 Perform various sheet-metal operations.

4.3.3 Shearing

4.3.4 Bending

4.3.5 Drawing

4.3.6 Squeezing.

4.3.7 Marking on sheet

4.3.8 Snipping.

4.3.9 Grooving

5 Welding Shop

- 5.1 Identification and use of the various tools and equipments.
- 5.2 Perform the arc welding and gas welding operations.
- 5.3 Perform the soldering and Brazing operations.

6 Machine shop

- 6.1 Identification and use of the various tools and equipments.
- 6.2 Classification of lathe and operation of lathe.
- 6.3 Plane turning
- 6.4 Taper turning
- 6.5 Treading
- 6.6 Drilling
- 6.7 Various attachment used in lathe.

Reference Books

- (1) Workshop Technology (Vol-1) Hazra & choudhary .
- (2) Workshop Technology – (Vol-1 & 2) Chapnan (3) Manufacturing process (Vol-1) Delela (4) Materials and Manufacturing Lindberg processes.





SEMESTER-II

RAIPUR

DIEE201

COMMUNICATION SKILLS - II

Course Objective-

Language is the most commonly used and effective medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and be able to pursue the present course of study and handle the future jobs in industry. The objective of this course is to assist the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension, improve vocabulary, develop grammatical ability, enhance writing skills, correspond with others, enhance skills in spoken English.

DETAILED CONTENTS

Unit-I

Prose Text Book

The following six chapters of A Book of English published by Mc millan India

Uncle Podger Hangs a Picture

Subash Chandra Bose

A Pair of Mustachios

Guru Gobind Singh

With The Photographer

Sir Jagdish Chandra Bose

There will be one general question from one of these six chapters.

Precise writing (selected from the prescribed 6 chapters of Prose Text Book)

Unit-II Grammar

- Antonyms change of words into different parts of speech
- Correspondence

Business letters such as:

Registration as supplier

Floating quotations and tenders

Quarry for product specification, price and other details etc from a firm/Company

Covering letter for quoting prices against a quotation/tender

Placing supply order

- Note-Making
- Interview Skills

Unit-III

Official letters such as:

- Letter to editor for placing an advertisement in the newspaper for purchase/selling of goods
- Letter to General Manager, Telephone Department for restoring a dead telephone/shifting a telephone
- Letter to Municipal Commissioner for improving water supply/ sanitation system in your locality
- Letter to State Electricity Board for repair of street lighting/ correction of bills etc.
- Letter to the supplier for rectifying or replacing a defective machinery/item of purchase
- Letter to Registrar, State Board of Technical Education for allowing to improve grades/marks in diploma examination

Unit-IV

- Report Writing
- Drafting a technical report of a visit to a factory, construction site, modern office, etc.
- Report writing on current general themes/topics related to economy, industry, social issues
- Elements of periodical progress report
- Inspection Note
- Write an inspection note after inspecting technical/industrial goods
- Write an inspection note after visiting a construction site or production shop
- Writing “Preface” and “acknowledgement” of a project report
- A paragraph on current topics/themes

Technology

Science

Economy

Politics

Social

General

- Drafting
- Press notes

- Memos/circulars
- Notices (lost and found: obituary/auction, etc)
- Telegrams
- Press releases
- Agenda and minutes of the meeting
- Personal resume/curriculum vitae

Unit-V

Communication Techniques

- Importance of communication
- Types of communication – verbal and non-verbal
- One way and two-way communication
- Process of communication – horizontal, vertical, upward, downward
- Essentials of good communication
- Level of communication – inter and intra personal, group to person, group to group
- Methods of effective oral, written and non-verbal communication, Horizons – tone, frequency, rate, volume, depth
- Barrier to communication and overcoming barriers
- Listening skill
- Use of audio visual aids for effective communication

Reference Books

Essentials of Business Communication by Pal and Rorualling; Sultan Chand and Sons

The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India

New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,

New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,

A Practical English Grammar by Thomson and Marlinet

Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill

English Conversation Practice by Grount Taylor; Tata McGraw Hill

Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi

Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi

Communication Skills by Ms. R Datta Roy and KK Dhir, Vishal Publication, Jalandhar

Course Outcome –

1. Students will be better equipped in the skills essential for effective communication.
2. This course will instruct students about the in-depth knowledge of career oriented communication.



APPLIED MATHEMATICS – II

RATIONALE

Applied Mathematics forms the backbone of engineering discipline. Basic elements of differential calculus, integral calculus, differential equations and coordinate geometry have been included in the curriculum as foundation course and to provide base for continuing education to the students.

DETAILED CONTENTS

Unit: I

Function and limit

Function –definition of variable constant interval such as open closed semi open etc

Definition of function value of a function and types of functions

Limit –definition of limit limits of algebraic trigonometric exponential and logarithmic function

Unit: II

Differentiation

Definition of differentiation

Differentiation by first principle of x^n , $(ax + b)^n$, $\sin x$, $\cos x$, $\tan x$, $\sec x$, $\operatorname{cosec} x$ and $\cot x$, e^x , a^x , $\log x$. Differentiation of a function of a function and explicit and implicit functions

Differentiation of sum, product and quotient of different functions

Unit: III

Integral Calculus

Integration as inverse operation of differentiation

Simple integration by substitution, by parts and by partial fractions

Evaluation of definite integrals (simple problems) by explaining the general properties of definite integrals

Unit: IV

Statistics

measures of central tendency. Mean, median, Mode

Measure of Dispersion mean, Standard deviation

Mean deviation variance and coefficient of variation comparison of

Two sets

Unit: V

Differential Equation

Definition of differential equation

Order of differential equation

Explanation of order and degree

Solution of differential equation of first order and first degree

Reference Books:

1. Higher Engineering Mathematics by BS Grewal
2. Engineering Mathematics by BS Grewal
3. Engineering Mathematics vol. II by S Kohli and Others, IPH, Jalandhar
4. Engineering Mathematics by Ishan Publication
5. Applied Mathematics Vol. II by SS Sabharwal and Others; Eagle Parkashan, Jalandhar
6. Engineering Mathematics by IB Prasad
7. Applied Mathematics Vol. II by Dr RD Sharma
8. Advanced Engineering Mathematics by AB Mathur and VP Jagi; Khanna Publishers, Delhi
9. Higher Engineering Mathematics by BS Grewal; Khanna Publishers, Delhi
10. Engineering Mathematics by C Dass Chawla; Asian Publishers, New Delhi

APPLIED PHYSICS – II

RATIONALE

Applied physics includes the study of a large number of diverse topics related to things that go in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

DETAILED CONTENTS

Unit: I

Applications of sound waves.

- Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time
- Ultrasonic's – production (magnetostriction and peizo-electric) and their engineering applications

Unit: II

Principle of optics

- Introduction: reflection of light, image formation in mirrors (convex and concave), refraction and refractive index, image formation in lenses, lens formulae (thin lens only), power of lens, total internal reflection
- Defects in image formation by lenses and their correction
- Simple and compound microscope, astronomical and Galileo telescope, magnifying power and its calculation (in each case)
- Overhead projector and slide projector

Unit: III

Electrostatics

- Coulombs law, unit charge
- Gauss's Law
- Electric field intensity and electric potential
- Electric field of point charge, charged sphere (conducting and non-conducting), straight charged conductor, plane charged sheet
- Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors
- Dielectric and its effect on capacitors, dielectric constant and dielectric break down

Unit: IV

Electricity

- Ohm's law
- Resistance of a conductor, specific resistance, series and parallel combination of resistors, effect of temperature on resistance
- Kirchhoff's laws, Wheatstone bridge principle and its applications
- Heating effect of current and concept of electric power
- Semi conductor physics
- Energy bands, intrinsic and extrinsic semi conductors, p-n junction diode and its characteristics
- Diode as rectifier – half wave and full wave rectifier, semi conductor transistor pnp and npn (concept only)

Unit: V

Modern Physics

- Lasers: concept of energy levels, ionization and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, helium – neon and ruby lasers and applications
- Fiber optics: Introduction, optical fiber materials, types, light propagation and applications
- Super conductivity: Phenomenon of super conductivity, effect of magnetic field, critical field, type I and type II super conductors and their applications)
- Energy sources – conventional and non-conventional (wind, water, solar, bio, nuclear energy), only elementary idea

LIST OF PRACTICALS

1. To verify Ohm's law
2. To verify law of resistances in series and in parallel
3. To determine the magnifying power of a compound microscope
4. To determine the magnifying power of an astronomical telescope
5. To convert a galvanometer into an ammeter of a given range
6. To convert a galvanometer into a voltmeter of a given range
7. To find the wavelength of a He-Ne laser
8. To find the frequency of a tuning fork by a sonometer
9. To study characteristics of a pn junction diode

Reference books:

1. Applied Physics Vol. II, TTTI Publication Tata McGraw Hill, Delhi
2. Basic Applied Physics by RK Gaur; Dhanpat Rai Publications
3. Comprehensive Practical Physics - Volume I and II by JN Jaiswal; Laxmi Publishers
4. Numerical Problems in Physics - Volume I and II by RS Bharaj; Tata McGraw Hill
5. Simple Course in Electricity and Magnetism by CL Arora; S Chand and Co, New Delhi
6. Fundamental Physics - Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
7. A Text Book of Optics by Subramanian and Brij Lal
8. Physics Laboratory Manual by PK Palanisamy, Scitech Publications
9. Fundamentals of Physics by Resnick and Halliday, Asian Books Pvt. Ltd., New Delhi
10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi



RAIPUR

APPLIED CHEMISTRY-II

RATIONALE

The role of Chemistry and chemical products in every branch of engineering is expanding greatly. Now a day's various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behaviour when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.

DETAILED CONTENTS

Unit: I

Metallurgy

- A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), roasting calcinations and refining as applied in relation to various metallurgical operations
- Metallurgy of (i) Aluminum (ii) Iron with their physical and chemical properties
- Definition of an alloy, purposes of alloying, composition, properties and uses of alloys-brass, bronze, monel metal, magnalium, duralumin, alnico and invar

Unit: II

Fuels

- Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples
- Definition of Calorific value of a fuel and determination of calorific value of a liquid fuel with the help of Bomb calorimeter. Simple numerical problems based upon Bomb-calorimeter method of finding the Calorific values
- Brief description of 'Proximate' and 'Ultimate' analysis of a fuel. Importance of conducting the proximate and ultimate analysis of a fuel
- Qualities of a good fuel and merits of gaseous fuels over those of other varieties of fuels
- Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas

Unit: III

Corrosion

- Meaning of the term 'corrosion' and its definition
- Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory
- Prevention of corrosion by
 1. (a) Alloying
 - (b) Providing metallic coatings
 2. Cathodic protections:
 - (a) Sacrificial
 - (b) Impressed voltage method

Lubricants

- 1 Definition of (i) lubricant (ii) lubrication
- 2 Classification of lubricants
- 3 Principles of lubrication
 - (i) Fluid film lubrication
 - (ii) Boundary lubrication
 - (iii) Extreme pressure lubrication
- 4 Characteristics of a lubricant such as viscosity, viscosity index, volatility, oiliness, acidity, emulsification, flash point and fire point and pour point.

Cement and Glass

- 1 Manufacture of Portland cement
- 2 Manufacture of ordinary glass and lead glass

Classification and Nomenclature of Organic Compounds

Classification of Organic Compounds, functional group, Homologous Series, Nomenclature, Physical and Chemical properties, and industrial use of Organic Compounds, IUPAC system of Nomenclature of Carboxylic acid, Alcohols, Phenols, Aldehydes, Ketones and Amines.

LIST OF PRACTICALS

1. Gravimetric analysis and study of apparatus used there in
2. To determine the percentage composition of a mixture consisting of a volatile and a nonvolatile substances
3. Determine the viscosity of a given oil with the help of “Redwood viscometer”
4. Determine the flash point of the given oil with the help of Abel’s Flash Point Apparatus
5. Estimate the amount of moisture in the given sample of coal
6. Estimate the amount of ash in the given sample of coal
7. Electroplate the given strip of Cu with Ni
8. Confirmation test of alcohol, aldehydes, carboxylic acid, amine
9. Determination of copper in the given brass solution, or sample of blue vitriol volumetrically
10. Detection of metal iron in the rust (solution of rust in concentrated HCL may be given).



BASIC ELECTRICAL ENGINEERING

Unit: I

Application and Advantages of Electricity:

- Difference between AC and DC
- Various applications of electricity
- Advantages of electrical energy over other types of energy

Basic Quantities of Electricity

- Definition of voltage, current, power and energy with their units
- Name of the instruments used for measurement of quantities given in 5.1
- Connection of the instruments in 5.2 in electric circuit

Unit: II

Various Types of Power Plants:

- Elementary block diagram of thermal, hydro and nuclear power stations
- Brief explanation of the principle of power generation in above power stations

Elements of Transmission Line:

- Pictorial diagram of a three-phase transmission and distribution system showing transformers, supports, conductors, insulators and earth wire etc.
- Brief function of accessories of transmission lines
- Earthing of lines, substation and power station - need and practices adopted

Unit: III

Distribution System:

- Distinction between high and low voltage distribution system
- Identification of three phase wires, neutral wires and the earth wire on a low voltage distribution system
- Identification of the voltage between phases and between one phase and neutral
- Distinction between three phase and single phase supply

Supply from the Poles to the Distribution Board:

- Arrangement of supply system from pole to the distribution board
- Function of service line, energy meter, main switch, distribution board

Unit: IV

Domestic Installation:

- Distinction between light and fan circuits and single phase power circuit, sub circuits
- Various accessories and parts of installation, identification of wiring systems
- Common safety measures and earthing
- Introduction to BIS code of safety and wiring installation

Unit: V

Electric Motors and Pumps:

- Definition and various application of single phase and three phase motors
- Connection and starting of three phase motors by star delta starter
- Conversion of horse power in watts or kilowatts
- Type of pumps and their applications

List of Practical's

1. Use of Megger:

Objective: To make the students familiar with different uses of megger

2. Connection of a three phase motor and starter including fuses and reversing of direction of rotation.

Objective: Students may be made familiar with the equipment needed to control a three-phase motor . The students must experience that by changing any two phases, the direction of rotation is reversed.

3. Connection of a lamp, ceiling fan, socket outlet, geyser, floor grinder, voltage stabilizer etc.

Objective: Students may be made familiar with the different types of equipment and circuits used in the domestic installations

4. Trouble shooting in a three-phase motor

Note: The teacher may create anyone of the following faults

- (a) Loose connections
- (b) Blown fuse
- (c) Tripped overload protection
- (d) Incorrect direction of rotation

- (e) Single phasing
- (f) Burnt winding to be simulated by a loose connection behind a terminal box.

Objective: The students must be able to detect the most common faults, which may occur in a three-phase motor, using meggar wherever necessary

5. Trouble shooting in a domestic wiring system.

Note: The teacher may introduce a fault in the existing wiring system of a classroom or workshop like

- (a) blown fuse
- (b) loose connection
- (c) faulty components/accessories etc.

Objective: Students must be able to detect common faults which may occur in a domestic wiring system

6. Treatment of electric shock

Note: The teacher may give a demonstration how an electric shock must be treated.

Objective: Students must be trained to treat the persons suffering from an electric shock

7. Study of a distribution Board

Note: Students may be asked to study the distribution board in the institution and note down all accessories.

Objective: Students must be made familiar with the distribution board

8. Connections and reading down an energy meter

Objective: Students may be asked to connect an energy meter to a load and calibrate reading

9. Demonstration in electrical machine laboratory

Objective: Students may be shown different types of electrical machines and their starters and should be told that the three phase induction motors are most commonly used.

10. Study of submersible motor pump set:

Objective: To tell use of the set in water supply and irrigation works.

Reference books:

1. Electrical Technology, Fifth Edition by Edward Hughes, Longman Publishers
2. Electrical Technology by BL Theraja, S Chand and Co, New Delhi
3. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Sons, New Delhi
4. Experiments in Basic Electrical Engineering by SK Bhattacharya, KM Rastogi; New Age International (P) Ltd.; Publishers New Delhi
5. Principles of Electrical Engineering by BR Gupta, S Chand and Co, New Delhi
6. Electrical Engineering by DR Arora; Ishan Publications, Ambala
7. Basic Electrical Engineering by PS Dhogal, Tata Mc Graw Hill, New Delhi
8. Basic Electrical Engineering by JB Gupta; SK Kataria and Sons, New Delhi
9. Experiments in Basic Electrical Engineering by GP Chalhotra, Khana Publishers, New Delhi
10. Basic Electrical Engineering by T.S. Anand, North Publications, Jalandhar.



RAIPUR

Engineering Drawing-II

RATIONALE

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

- Note: 1. First angle projection is to be followed
2. Minimum of 15 sheets to be prepared by each student
 3. SP 46 – 1988 should be followed
 4. Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

DETAILED CONTENTS

Unit-I

Detail and Assembly Drawing

Principle and utility of detail and assembly drawings

Wooden joints i.e. corner mortice and tenon joint, Tee halving joint, Mitre faced corner joint, Tee bridle joint, Crossed wooden joint, Cogged joint, Dovetail joint, Through Mortice and Tenon joint, Corner and Through halving joint, Closed Mortise and Tenon joint

Threads

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

Forms of various external thread sections such as V, square and acme threads, BA, BSW and Knuckle, Metric, Seller Thread, Buttress Threads

Simplified conventions of left hand and right hand threads, both external and internal threads

Unit-II

Locking Devices

Lock nuts, castle nuts, split pin nuts, sawn nuts, slotted nut

Nuts and Bolts

Different views of hexagonal and square nuts; Different views of hexagonal and square nuts; Assembly of hexagonal headed, square headed, square headed with square neck bolts with hexagonal and square nuts and washers. Foundations bolts

– Rag bolt and Lewis bolt

Screws, Studs and Washers

Drawing various types of machine screws

Drawing various types of studs and set screws

Unit-III

Keys and Cotters

Various types of keys and cotters and their practical application and preparation of drawing of various keys and cotters showing keys and cotters in position

Cotter joints (i) sleeve and cotter joint (ii) gib and cotter joint (iii) knuckle joint (iv) Spigot and socket joint

Rivets and Riveted Joints

Types of structural and general purpose rivet heads Caulking and fullering of riveted joints

Types of riveted joints – lap, butt (single riveted, double riveted lap joint, single cover plate and double cover plate), chain and zig – zag riveting

Unit-IV

Welded Joints

Various conventions and symbols of welded joints (IS 696)

Practical applications of welded joints say joints on steel frames, windows, doors and furniture

Couplings

Muff or Box coupling, half lap muff coupling
Flange coupling (Protected and non-protected) Flexible coupling

Symbols and Conventions

Civil engineering sanitary fitting symbols

Electrical fitting symbols for domestic interior installations

Building plan drawing with electrical and civil engineering symbols

Unit-V

Development of Surfaces

Construction of geometrical figures such as square, pentagon, hexagon

Development of surfaces of cylinder, square, pentagonal and hexagonal, Prism, Cone and Pyramid, Sequence pentagonal and hexagonal pyramid

Interpenetration of

Cylinder to cylinder

Cylinder to cone

AUTO CAD

Concept of AutoCAD, Tool bars in AutoCAD, coordinate system, snap, grid, and ortho mode

Drawing commands – 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 entity

Note – Practical syllabus will be based on detailed syllabus.

Reference Books

1. Elementary Engineering Drawing (in first angle projection) by ND Bhatt, Charotar Publishing House
2. A Text Book of Engineering Drawing by Surjit Singh Published by Dhanpat Rai and Co. Delhi
Engineering Drawing by PS Gill; published by SK kataria and Sons, New Delhi





SEMESTER -III

RAIPUR

Electrical & Electronics Engg. Material

RATIONALE

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

DETAILED CONTENTS

Unit-I

Classification:

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

Conducting Materials

Introduction

Resistance and factors affecting it such as alloying and temperature etc

Superconductor

Classification of conducting material as low resistivity and high resistivity materials Low resistance materials

Copper:

Its general properties as conductor, resistivity, temperature coefficient, density, mechanical properties of hard-drawn and annealed copper, corrosion, contact resistance. Application in the field of electrical engineering.

Aluminium:

General properties at conductor, resistivity, temperature coefficient, density, mechanical properties of hard and annealed aluminium, solderability, contact resistance. Applications in the field of electrical engineering.

Steel:

General properties at conductor, resistivity, corrosion, temperature coefficient, density, mechanical properties, solderability, Applications in the field of electrical engineering.

Unit-II

Introduction to handle conductors and its applications.

Low resistivity copper alloys: Brass, Bronze (cadmium and Beryllium), their practical applications with reasons for the same

Applications of special metals e.g. Silver, Gold, Platinum etc.

High resistivity materials and their applications e.g., manganin, constantin, Nichrome, mercury, platinum, carbon and tungsten

Superconductors and their applications

Semi-conducting Materials

Introduction

Semi-conductors and their properties

Different semi-conducting materials (silicon and germanium) used in manufacture of various semiconductor devices (i.e. p-type and n-type semiconductors)

Materials used for electronic components like resistors, capacitors, diodes, transistors and inductors etc.

Unit-III

Insulating materials; General Properties:

Electrical Properties:

Volume resistivity, surface resistance, dielectric loss, dielectric strength (breakdown voltage) dielectric constant

Physical Properties:

Hygroscopicity, tensile and compressive strength, abrasive resistance, brittleness

Thermal Properties:

Heat resistance, classification according to permissible temperature rise. Effect of overloading on the life of an electrical appliance, increase in rating with the use of insulating materials having higher thermal stability, Thermal conductivity, Electro-thermal breakdown in solid dielectrics

Chemical Properties:

Solubility, chemical resistance, weather ability

Mechanical properties, mechanical structure, tensile structure

Unit-IV

Insulating Materials and their applications:

Plastics

Definition and classification

Thermosetting materials:

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

Thermo-plastic materials: Polyvinyl chloride (PVC), polyethelene, silicons, their important properties and applications

Natural insulating materials, properties and their applications

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

Gaseous materials; Air, Hydrogen, Nitrogen, SF₆ their properties and applications

Unit-V

Magnetic Materials:

Introduction - ferromagnetic materials, permeability, B-H curve, magnetic saturation, hysteresis loop (including) coercive force and residual magnetism, concept of eddy current and hysteresis loss, curie temperature, magnetostriction effect.

Soft Magnetic Materials:

Alloyed steels with silicon, high silicon, alloy steel for transformers, low silicon alloy steel for electric rotating machines

Cold rolled grain oriented steels for transformer, Non-oriented steels for rotating machine

Nickel-iron alloys

Soft Ferrites

Hard magnetic materials Tungsten steel, chrome steel, hard ferrites and cobalt steel, their applications

Special Materials

Thermocouple, bimetals, leads soldering and fuse material, mention their applications

Introduction of various engineering materials necessary for fabrication of electrical

Machines such as motors, generators, transformers etc

Note- Practical syllabus will be based on detailed syllabus

Reference Books:

1. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi
2. Electronic Components and Materials by Grover and Jamwal, Dhanpat Rai and Co., New Delhi
3. Electrical Engineering Materials by Sahdev, Unique International Publications
4. Electronic Components and Materials by SM Dhir, Tata Mc Graw Hill, New Delhi
5. Electronic Engineering Materials by ML Gupta, Dhanpat Rai & Sons, New Delhi
6. Electrical Engineering Materials by PL Kapoor, Khanna Publishers, New Delhi
7. Electrical & Electronics Engineering Materials BR Sharma and Others, Satya Parkashan, New Delhi

RAIPUR

Fundamental of Electrical Engg

RATIONALE

For a diploma holder in electrical engineering, it becomes imperative to know the fundamentals of the subject in order to grasp the knowledge of the field. This subject will provide knowledge of fundamental concepts of electricity, magnetism and various principles related to it.

DETAILED CONTENTS

Unit-I

Applications and Advantages of Electrical Energy

- Different forms of energy
- Advantages of electrical energy
- Difference between AC and DC
- Uses of electrical energy

Basic Electrical Quantities

- Basic concept of charge, current, voltage, resistance, power, energy and their units
- Conversion of units of work, power and energy from one form to another

Unit-II

Batteries

- Basic idea about primary and secondary cells
 - working principle, construction and applications of Lead acid battery and Nickel Cadmium cells, Silver Oxide Cells
 - Charging methods used for lead acid accumulator
 - Care and maintenance of lead acid battery
- Grouping of cells in series and parallel (simple numerical problems).

Unit-III

DC Circuits

- Ohm's law, resistances in series and parallel
 - Kinchoff laws and their applications in solving electrical network problems
 - Network theorems such as theorem and Newton theorem
- Star-delta transformation

Magnetism and Electromagnetism:

- Introduction to electromagnetism, Magnetic field around a straight current carrying conductor and a solenoid and methods to find its direction, force between two parallel current carrying conductors.
 - Force on a conductor placed in the magnetic field
 - Series magnetic circuits, simple problems
- Concept of hysteresis, hysteresis loop and hysteresis loss.

Unit-IV

Electromagnetic Induction:

- Faraday's Laws of electromagnetic induction
- Lenz's law
- Fleming's Right and Left Hand Rule
- Principle of self and mutual induction
- Principle of self and mutually induced e.m.f. and simple problems
- Inductances in series and parallel
- Energy stored in a magnetic field
- Concept of eddy currents, eddy current loss

Unit-V

AC Fundamentals

- Concept of alternating current and voltage, equation of instantaneous values
- Representation of alternating sinusoidal quantities by vectors
- Phasor algebra (addition, subtraction, multiplication and division of complex quantities)
- AC through pure resistance, inductance and capacitance
- Concept of susceptance, conductance and admittance
- Alternating voltage applied to RL, RC and RLC series and parallel circuits (impedance triangle, phasor diagram and their solutions)
- Power in pure resistance, inductance, capacitance, RL, RC, RLC circuits
- Active and reactive components of current and their significance
- Power factor and its practical significance
- Resonance in series and parallel circuits
- J-notation and its application in solving problems in ac circuits

Polyphase systems

- Advantages of 3 phase over single phase system
- Star and delta connections (relationship between phase and line voltages, phase and line currents Power in 3 phase circuits)
- Measurement of power and power factor of a 3 phase load by two wattmeter Method

LIST OF PRACTICALS

- (a) Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions (to verify ohm's law)
- (b) Filament lamp
- ☑ Measure the resistance of a cold lamp filament with the help of calculations.
- ☑ Measure the current drawn by the lamp at different voltages from zero to 220 volts and the resistance of lamp at different voltages, plot a graph between current and voltage
- (a) To verify that $R_t = R_1 + R_2 + \dots$ where R_1, R_2 etc. are resistances connected in series

(b) To verify $\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$

-- = -- + -- + ----- + --

$R_t \quad R_1 \quad R_2 \quad R_m$

Where R_1, R_2 etc. are resistances connected in parallel

3. Verification of Kirchhoff's current and voltage laws applied to DC circuits
 - a) To construct a circuit arrangement consisting of resistances in series, parallel combination
 - b) Identification of node points in the circuit
 - c) To see that algebraic sum of currents at node point is zero
 - d) To see that algebraic sum of emfs and voltage drops in a closed loop is zero
4. To find ratio of inductance values of a coil having air /iron core respectively and to see the effect of introduction of a magnetic core on coil inductance
5. To construct an RL and RC circuit and to measure
 - a) Impedance of the circuit
 - b) Phase angle between voltage and current
 - c) Construct impedance triangle
6. Measurement of power and power factor of a single phase RLC circuit. To calculate KVA and KVAR
7. Measurement of power and power factor of a 3-phase circuit by using 2- wattmeter method using induction motor as a load and to calculate KVA and KVAR

Note: The results should be verified analytically also.

Reference Books:

1. Electrical Science by VK Mehta, S Chand & Co., New Delhi
2. Electrical Science by Sahdev, Unique International Publication, Jalandhar
3. Electrical Engineering by DR Arora, Ishan Publications, Ambala
4. Electrical Science by JB Gupta, SK Kataria & Sons, New Delhi
5. Electrical Technology by BL Theraja, S Chand & Co., New Delhi
6. Electrical Science by Trilok Singh, SK Kataria, New Delhi
7. Electrical Science by S. Chandni, R Chakrabarti and PK Chattopadhyay. Narosa Publishing House Pvt. Ltd., New Delhi
8. Basic Electrical Engineering by Mool Singh, Galgotia Publication Pvt. Ltd., New Delhi
9. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill, New Delhi
10. Principles of Electrical Engineering y BR Gupta, S Chand & Co., New Delhi
11. Handbook of Electrical Engineering by SL Bhatia, Khanna Publishers, New Delhi
12. Electrical Power System by S Channi Singh, McGraw Publishing Co.

R A I P U R

Basic Electronics

RATIONALE

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

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

DETAILED CONTENTS

Unit-I

Introduction

Brief history of development of electronics

Active and passive components

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

Difference between actual voltage source and constant voltage source

Semi-conductor Theory

Atomic structure, crystalline structure

Energy band theory of crystals, energy band structure of insulator, semiconductor and conductor, generation and recombination. Energy band structure of Silicon and Germanium

Silicon versus Germanium for mobility and conductivity

Concept of intrinsic and extrinsic semiconductors

Effect of temperature on intrinsic and extrinsic semiconductors

Unit-II

Semiconductor Diodes

PN Junction, mechanism of current flow in PN junction, drift and diffusion currents, depletion layer, potential barrier, effect of forward and reverse biasing and a PN junction. Concept of junction capacitance in forward and reverse biased conditions. Breakdown mechanism

Ideal diode, Semiconductor diode characteristics, static and dynamic resistance

Use of diode as half wave and full wave rectifiers (centre tapped and bridge type), relation between DC output and AC input voltage, rectifier efficiency

Concept of ripples, filter circuits – shunt capacitor, series inductor, and pie (π) filters and their applications

Diode ratings/specifications

Various types of diodes such as zener diode, varactor diode, schottky diode, light emitting diode, tunnel diode, photo diode; their working characteristics and applications

Zener diode and its characteristics

Use of zener diode for voltage stabilization

Unit-III

Bi-polar Transistors

Concept of junction transistor, PNP and NPN transistors, their symbols and mechanism of current flow

Transistor configurations: common base (CB), Common emitter (CE) and common collector (CC), current relation and their input/output characteristics; comparison of the three configurations

Transistor Biasing and Stabilization

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

Difference between circuits, limitations, simple problems to calculate operating point in different biasing circuits. Use of thevenin theorem to determine operating point

Effect of temperature on the operating point of a transistor
Concept of h-parameters of a transistor

Use of data book to know the parameters of a given transistor

Unit-IV

Single-Stage Transistor Amplifiers

Single stage transistor amplifier circuit in CE configuration, function of each component

Working of single stage transistor amplifier, physical and graphical explanation, phase reversal
Concept of DC and AC load line

Voltage gain of single stage transistor amplifier using characteristics of the device
Concept of input and output impedance

AC equivalent circuit of single stage transistor amplifiers
Calculation of voltage gain using AC equivalent circuit
Frequency response of a single stage transistor amplifier

Unit-V

Multi-Stage Transistor Amplifiers

Need of multi-stage transistor amplifiers – different types of couplings, their purpose and applications.

Knowledge of various terms such as voltage gain, current gain, power gain, frequency response, decibel gain and band width

RC coupled two-stage amplifiers, circuit details, working, frequency response, applications
Loading effect in multistage amplifiers

Elementary idea about direct coupled amplifier, its limitations and applications

Transformer coupled amplifiers, its frequency response. Effect of co-efficient of coupling on frequency response. Applications of transformer coupled amplifiers

Field Effect Transistor (FET)

Construction, operation, characteristics and applications of a N channel JFET and P channel JFET
JFET as an amplifier

Construction, operation, characteristics and applications of a MOSFET in depletion enhancement mode

Comparison between BJT, JFET and MOSFET

LIST OF PRACTICALS

1. a) Identification and testing of electronic components such as resistor, inductor, capacitor, diode,

transistor and different types of switches used in Electronic circuits

- b) Measurement of resistances using multimeter and their comparison with colour code values
2. V-I characteristics of a Semiconductor diode and to calculate its static and dynamic resistance
3. a) V-I characteristics of a zenor diode and finding its reverse breakdown voltage
- b) Fabrication of a zenor diode voltage stabilizer circuit using PCB
4. Observation of input and output wave shapes of a half-wave rectifier and verification of relationship between dc output and ac input voltage
5. Observation of input and output wave shapes of a full wave rectifier and verification and relationship between dc and ac input voltage
6. Observation of input and output wave shapes of a full wave rectifier with (i) shunt capacitor (i) series inductor (i) π filter circuits
7. Plotting input and output characteristics of a transistor in CB configuration
8. Plotting input and output characteristics of a transistor in CE configuration
9. Measurement of operating point in case of (i) fixed biased circuit (i) potential divider biasing circuit and to observe the effect of temperature variation on the operating point.
10. To measure the voltage gain and band width by plotting frequency response curve of a single stage amplifier using CE configuration at different loads
1. To study the effect of coupling capacitor on lower cut of frequency and upper cut of frequency by plotting frequency response curve of a two stage RC coupled amplifier
12. To plot V-I characteristics of a FET

Reference Books:

1. Basic Electronics and Linear Circuits by NN Bhargava, Tata McGraw Hill, New Delhi
2. Analog Electronics by BP Arora, Ishan Publications, Ambala
3. Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New Delhi
4. Electronic Devices and Circuits by R Boylestead
5. Electronic Devices and Circuits by Ravi Raj Dubey
6. Analog Electronics by JC Karhara, King India Publication, New Delhi
7. Electrical Devices and Circuits by Rama Reddy, Narosa Pulishing House Pvt. Ltd., New Delhi

Electrical Engg Design & Drawing-I

RATIONALE

A polytechnic pass-out in electrical engineering is supposed to have ability to :

- i) Read, understand and interpret engineering drawings
- ii) Communicate and correlate through sketches and drawings
- iii) Prepare working drawings of alternative panels, transmission and distribution

The contents of this subject has been designed to develop requisite knowledge and skills of electrical drawings in the students of diploma in electrical engineering.

DETAILED CONTENTS

Unit-I

Simple light and Alarm Circuits

- One lamp controlled by two switches (staircase circuit)
- Two lamps controlled by three switches (double staircase circuit) Circuit using master switch
- Fluorescent tube controlled from one switch
- One bell controlled by one push button

Unit-II

- Two ordinary bells (for day and night) used at a distant residence
- Nos. of bells controlled by separate switches
- Bell response circuit using one bell and one relay
- Bell response circuit of an office (for three rooms)
- Traffic light control system for two road crossing

Unit-III

Design and draw wiring circuit of a two room set for light and fan circuit

- To draw Installation plan and wiring diagram of two room house
- Conductor size calculation
- List of material required with cost by doing market survey
- Description of various tests to test the wiring installation before commissioning

Unit-IV

Orthographic Projection of Simple Electrical parts

- Kit kat fuse base
- Kit kat fuse carrier
- Bus bar post
- Pin type and shackle type insulator

Unit-V

- Engineering translator
- Stay insulators
- M.C.B.
- E.L.C.B.
- Bobbin of a small transformer/choke

Note- Practical syllabus will be based on detailed syllabus.

Reference Books:

1. Electrical Engineering Design and Drawings by Surjit Singh, Khanna Publishers, New Delhi
2. Electrical Engineering Design and Drawings by SK Bhattacharya, SK Kataria and Sons, New Delhi
3. Electrical Engineering Design and Drawings by Ubhi & Marwaha, IPH, New Delhi
4. Electrical Design and Drawing by SK Sahdev, Unique International Publications, Jalandhar



Computer Programming & Application

RATIONALE

Computers play a very vital role in present day life, more so, in the professional life of diploma engineers. With the extensive use of Information Technology in large number of areas, the diploma engineers should be well conversed with these environments. In order to enable the students to use the computers effectively in problem solving, this course offers the modern programming languages like C along with exposition to various engineering applications of computers.

DETAILED CONTENTS

Unit-I

Information Storage and Retrieval

Need for information storage and retrieval
Creating data base file

Querying database file on single and multiple keys
Ordering the data on a selected key

Programming a very simple application

Unit-II

Programming in C

Basic structure of C programs
Executing a C program

Constants, variables, and data types
Operators and expressions

Unit-III

Managing Input-Output operations like reading a character, writing a character, formatted input, formatted output through print, scan, getch, putch statements etc.

Decision making and branching using IF..... else, switch, go to statements
Decision making and looping using do-while, and for statements

Unit-IV

Arrays - one dimensional and two dimensional
File

Computers Application Overview

Commercial and business data processing application
Engineering computation

Unit-V

CAD, CAM, CAE, CAI

Typical Applications:

Students will be required to make a small programme for analysis of circuits design in Electrical Engineering components or any other area.

Use of various software available in the field of electrical engineering

LIST OF PRACTICALS

1. Programming exercise on executing a C Programs.
2. Programming exercise on editing a C program.
3. Programming exercise on defining variables and assigning values to variables
4. Programming exercise on arithmetic and relation operators
5. Programming exercise on arithmetic expressions and their evaluation
6. Programming exercise on reading a character
7. Programming exercise on writing a character
8. Programming exercise on formatting input using print
9. Programming exercise on formatting output using scan
10. Programming exercise on simple IF statement
11. Programming exercise on IF... ELSE statement
12. Programming exercise on SWITCH statement
13. Programming exercise on GOTO statement
14. Programming exercise on DO-WHILE statement
15. Programming exercise on FOR statement
16. Programming exercise on one dimensional arrays
17. Programming exercise on two dimensional arrays
18. Demonstration of Application software to Electrical Engineering branch such as:
MATLAB, PSIM,
19. MULTISIM, PSPICE in Electrical Engineering

Reference Books:

1. Programming in C by Sachaum Series, McGraw Hills
2. The essentials of Computer Organizing and Architecture by Linda Null and Julia Labur, Narosa Publishing House Pvt. Ltd., New Delhi
3. Programming in C by Kerning Lan and Riechie Prentice Hall of India, New Delhi
4. Programming in C by Balaguru Swamy, Tata McGraw Hill, New Delhi
5. Let us C – Yashwant Kanetkar, BPB Publications, New Delhi
6. Vijay Mukhi Series for C and C++
7. Elements of C by MH Lewin, Khanna Publishers, New Delhi
8. Programming in C by R Subburaj, Vikas Publishing House Pvt. Ltd., Jangpura, New Delhi
9. Programming in C by Kris A Jansa, Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi
10. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi

Electrical Workshop Practice-I

RATIONALE

An electrical diploma holder will be required to inspect, test and modify the work done by skilled workers working under him. In addition, many a times, it will become necessary for him to demonstrate the correct method and procedure of doing a job. In order to carry out this function effectively in addition to conceptual understanding of the method or procedure he must possess appropriate manual skills. The subject aims at developing special skills required for repairing, fault finding, wiring in electrical appliances and installations.

DETAILED CONTENTS

1. Study of electrical safety measures and shock treatment
2. Wire jointing
 - Straight married joint
 - Technology-joint
 - Western union joint
 - Britania joint
 - Twist sleeve joint
 - Bolted type joint
3. Filling of thimbles and crimping of thimbles (using hydraulic and hand crimp)
4. Types of wiring and to make different light control circuits in the following types of wiring
 - Casing capping (PVC) wiring
 - Conduit wiring (surface/concealed)
5. Wiring of main distribution board with four outgoing circuits for light and fan loads including main switch and fuses (only internal connection)
6. Construction of an extension board with two 5A sockets, one 15A socket controlled by their respective switches, a fuse and indicator
7. Wiring of a switch board containing at least two switches, one fan regulator and one 5A socket controlled by their respective switches using (i) tumbler switches (ii) flush type switches
11. Wiring of a series test lamp board and to use it for finding out simple faults
12. Testing of domestic wiring installation using meggar
13. Fault finding and repair of a tube light circuit
14. Wiring and testing of alarm and indicating circuits using relay, push buttons and bells (simple single phase circuits)
15. Assembly of a 4-way distribution board using MCB, main switch and ELCB
16. Repair and maintenance of domestic electric appliances, i.e. electric iron, geyser, fan, heat converter, washing machine, desert room cooler, room heater, electric kettle, electric oven, electric furnace etc.

SEMESTER-IV

RAIPUR

Electrical Machine-I

RATIONALE

Electrical machines is a subject where a student will deal with various types of electrical machines which are employed in industries, power stations, domestic and commercial appliances etc. After studying this subject, an electrical diploma holder must be competent to repair and maintain these machines and give suggestions to improve their performance. Practical aspects of the subject will make the students capable of performing various tests on the machines as per latest BIS specifications

DETAILED CONTENTS

Unit-I

Introduction to Electrical Machines

- Definition of motor and generator
 - Torque development due to alignment of two fields and the concept of torque angle
 - Electro-magnetically induced emf
 - Elementary concept of an electrical machine
 - Comparison of generator and motor
- Generalised theory of electrical machines

Unit-II

DC Machines

- Main constructional features, Types of armature winding
 - Function of the commutator for motoring and generation action
 - Factors determining induced emf equation
 - Factors determining the electromagnetic torque
 - Significance of types of machines
 - Significance of back e.m.f., the relation between back emf and Terminal voltage
 - Performance and characteristics of different types of DC motors
- Speed control of dc shunt/series motors

Unit-III

- Need of starter, three point dc shunt motor starter and 4 point starter
- Applications of DC motors
- Faults in dc machines and their retrospective
- Losses in a DC machine
- Determine of losses by Swinburn test

Unit-IV

Transformers (single phase)

- Introduction
 - Constructional features of a transformer and parts of transformer
 - Working principle of a transformer
- EMF equation
- Transformer on no-load and its phasor diagram
- Transformer on load (including voltage drops and its phasor diagram)

Transformer – neglecting voltage drop in the windings – Ampere turn balance – its phasor diagram

Mutual and leakage fluxes, leakage reactance

Equivalent circuit

3.10 Relation between induced emf and terminal voltage, regulation of a transformer mathematical relation

Unit-V

Losses in a transformer

Open circuit and short circuit test. Calculation for efficiency, condition for maximum efficiency Cooling of transformer, conservator

Auto transformer construction, working and applications

Different types of transformers

Three Phase Transformers

Construction of three phase transformer

Types of three phase transformer i.e. delta-delta, delta-star, star-delta and starstar

Conditions for parallel operation (only conditions are to be studied)

On load tap changer, ON/OFF load tap changer

Difference between power and distribution transformer

Cooling of transformer

LIST OF PRACTICALS

1. Measurement of the angular displacement of the rotor of a slip-ring induction motor on application of DC to stator of motor winding in sequence and simultaneously to each phase of rotor winding
2. Speed control of dc shunt motor (i) Armature control method (ii) Field control method
3. Study of dc series motor with starter (to operate the motor on no load for a moment)
4. Study of 3 point starter for starting D.C. shunt motor.
5. To perform open circuit and short circuit test for determining: (i) equivalent circuit (ii) the regulation and (iii) efficiency of a transformer from the data obtained from open circuit and short circuit test at full load
6. To find the efficiency and regulation of single phase transformer by actually loading it.
7. Checking the polarity of the windings of a three phase transformer and connecting the windings in various configurations
8. Finding the voltage and current relationships of primary and secondary of a three phase transformer under balanced load in various configurations conditions such as (a) Star-star (b) Star delta (c) Delta star (d) Delta - Delta configuring conditions.

Reference Books:

1. Electrical Machines by SK Bhattacharya, Tata Mc Graw Hill, New Delhi
2. Electrical Machines by SK Sahdev, Unique International Publications, Jalandhar
3. Electrical Machines by Nagrath and Kothari, Tata Mc Graw Hill, New Delhi
4. Electrical Machines by SB Gupta, SK Kataria and Sons, New Delhi

Electrical Measurements and Measuring Instruments

RATIONALE

Diploma holders in Electrical Engineering has to work on various jobs in the field as well as interesting laboratories and on control panels, where he performs the duties of installation, operation, maintenance and testing of measuring instruments. Persons working on control panels in powerplants, substations and in industries will come across use of various types of instruments and have to take measurements. Instruments used to read and observe the general electrical quantities like current, voltage, power, energy, frequency, resistance etc and their wave shapes, have been incorporated in this subject. So the technician will know the construction and use of various types of instruments.

DETAILED CONTENTS

Unit-I

Introduction to Electrical Measuring Instruments:

- Concept of measurement and instruments
- Electrical quantities and instruments for their measurements
- Types of electrical measuring instruments – indicating, integrating and recording instrument
- Essentials of indicating instruments – deflecting, controlling and damping torque

Ammeters and Voltmeters (Moving coil and moving iron type):

- Concept of ammeters and voltmeters and difference between them
- Construction and working principles of moving Iron and moving coil instruments
- Merits and demerits, sources of error and application of these instruments

Unit-II

Wattmeter's (Dynamometer Type)

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

Energy meter (Induction type):

Construction, working principle, merits and demerits of single-phase and three-phase energymeters

- Errors and compensation
- Simple problems
- Construction and working principle of maximum demand indicators

Unit-III

Miscellaneous Measuring Instruments:

- Construction, working principle and application of Meggar, Earth tester, Multimeter, Frequency meter (dynamometer type) single phase power factor meter (Electrodynamometer type). Working principle of synchroscope and phase sequence indicator, tong tester (Clamp-on meter)
- Instrument Transformers: Construction, working and applications
 - a) CT
 - b) PT and their ratio and phase angle error

Unit-IV

Electronics Instruments:

- Cathode Ray Oscilloscope: Block diagram, working of CRO and its various controls. Applications of CRO.
- Digital multi-meter (only block diagram)

LRC meters.

Unit-V

Power Measurements in 3-phase circuits:

- Three wattmeter method
- Two watt meter method

Measurement of Non-electrical Quantities (Introduction only)

- Basic concept Pressure measurement, flow measurement, level measurement, displacement measurement

Measurement of Temperature

- Different types of thermometers, thermocouple, resistance temperature detector

PRACTICALS

- a) Study of different meters, such as: Ammeter, voltmeter, wattmeter & energy meter.
- b) .Measurement of electrical quantities by low range meter along with
 - i. Shunt & multiplier
 - ii.C.T. & P.T.
- c) Measurement of active & reactive power in 3-phase balance load circuit by one wattmeter method.
- d) Measurement of active & reactive power in 3-phase unbalance load circuit by two-wattmeter method. Effect of load PF.
- e) Calibration of energy meter at various P.F. by
 - (1) Standard energy meter
 - (2) Meter test bench
- f) Performance of
 - iii.Phase sequence meter
 - iv. P.F. & frequency meter
 - v.Maximum demand indicator KVA, KWH & KVAR meter.
- g) Measurement of low & medium resistance by Wheastone bridge.
- h) Measurement of low resistance by Kelvin double bridge.
- i) Measurement of earth resistance by Earth Tester.
- j) Measurement of insulation resistance by Megger.
- k) Use of potentiometer for the measurement of Resistance and emf
- m) Calibration of DC voltmeter and ammeter by potentiometer
- n) Use of Multimeter.

Reference Books:

1. Electrical Measurements and Measuring Instruments by Golding and Widdis; WheelerPublishing House, New Delhi
2. Electrical Measurements and Measuring Instruments by SK Sahdev, Unique InternationalPublications, Jalandhar
3. A Course in Electrical Measurement and Measuring Instruments by AK Sawhney and PLBhatia; Dhanpat Rai and Sons, New Delhi
4. Electric Instruments by D. Cooper
5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi, NewAge International (P) Ltd., Publishers, New Delhi
6. Electronics Instrumentation by Umesh Sinha
7. Basic Electrical Measurements by Melville B. Staut.

Electronics Devices & Circuits

RATIONALE

The purpose of the introduction of electronics in the electrical engineering diploma course has been already explained in the rationale of the subject Basic Electronics in this course topic like Amplifiers, Oscillators and Wave Shape Circuits have been dealt with.

DETAILED CONTENTS

Unit-I

Transistor Audio Power Amplifier

- Difference between voltage and power amplifier
- Important terms in Power Amplifier collector efficiency, distortion and dissipation capability
- Classification of power amplifier class A, B and C
- Class A single-ended power amplifier, its working and collector efficiency
- Impedance matching in a power amplifier using transformer
- Heat sinks in power amplifiers
- Push-pull amplifier circuit details, working and advantages (no mathematical derivations)
- Principles of the working of complementary symmetry push-pull amplifier

Unit-II

Tuned Voltage Amplifier

- Introduction
- Series and parallel resonance
- Single and double tuned voltage amplifiers
- Frequency response of tuned voltage amplifiers
- Applications of tuned voltage amplifiers

Feedback in Amplifiers

- Feedback and its importance, positive and negative feedback and their need A 3.2 Voltage gain of an amplifier with negative feedback $A = \frac{A_{v0}}{1 + A_{v0} \beta}$
- Effect of negative feedback on voltage gain, stability, distortion, band width, output and input impedance of an amplifier (No mathematical derivation)
- Typical feedback circuits
- Effect of removing the emitter by-pass capacitor on an ordinary CE transistor amplifier
- Emitter follower and its applications

Unit-III

Sinusoidal Oscillators

- Sinusoidal Oscillators – positive feedback in amplifiers
- Difference between an oscillator and an alternator
- Essentials of an oscillator
- Circuit details and working of LC oscillators viz. Tuned Collector, Hartley and Colpitt's oscillators
- R-C oscillator circuits, phase shift and Wein bridge oscillator circuits
- Introduction to piezoelectric crystal and crystal oscillator circuit

Unit-IV

Wave-Shaping and Switching Circuits

- Concept of Wave-shaping
- Wave-shaping circuits
- R-C differentiating and integrating circuits
- Diode clipping circuits
- Diode clamping circuits
- Application of wave-shaping circuits
- Transistor as a switch (explanation using CE transistor characteristics)
- Collector coupled astable, monostable, bistable multivibrator circuits (explanation using wave shapes). Brief mention of uses of multivibrators
- Working and applications of transistor inverter circuit using power transistors

Unit-V

Working Principles of different types of power suppliers viz. CVTs, UPS, Stabilizers, SMPS, IC voltage regulator etc.

Operational Amplifier

- The basic operational amplifier. The differential amplifier. The emitter coupled differential amplifier. Offset even voltages and currents
- . Basic operational amplifier applications, analog integrator and differentiator
- . Familiarisation with specifications and pin configuration of IC 741
- Block diagram and operation of 555 IC timer

LIST OF PRACTICALS

1. To study the effect of coupling capacitor on lower cut off frequency and upper cut off frequency by plotting frequency response curve of a two stage RC coupled amplifier
2. To measure (a) optimum load (b) output power (c) signal handling capacity of a push-pull amplifier
3. To observe the effect of negative current feedback on the voltage gain of a single stage transistor amplifier by removing emitter by-pass capacitor.
4. To measure (a) voltage gain (b) input and output impedance for an emitter follower circuit
5. To measure frequency generation in (a) Hartley (b) R-C Phase Shift oscillator
6. To observe the differentiated and integrated square wave on a CRO for different values of R-C time constant
7. Clipping of both portion of sine-wave using: a) diode and dc source b) zener diodes Clamping a sine-wave to: a) Negative dc voltage b) Positive dc voltage
8. To generate square-wave using an astable multivibrator and to observe the wave form on a CRO and verify the result using p-spice software
9. To observe triggering and working of a bistable multivibrator circuit and observe its output wave form on a CRO
10. To use the op-Amp (IC 741) as inverting one and non-inverting amplifiers, adder, comparator, integrator and differentiator and verify the result using p-spice software
11. To study the pin configuration and working of IC 555 and its use as monostable and astable multivibrator

12. To realize the regulated power supply by using three terminal voltage regulator ICs such as 7805, 7905, 7915 etc. and verify the result using p-spice software.

Reference Books:

1. A text book of Basic Electronics and Linear Circuits by NN Bhargava and others, TataMcGraw Hill, New Delhi
2. Electronics Principles by SK Sahdev, Dhanpat Rai and Co., New Delhi
3. Electronics Principles by Albert Paul Malina, Tata McGraw Hill, New Delhi
4. Operational Amplifiers and Linear Circuits by Rama Kant and A. Gaykwad, Prentice Hall ofIndia, New Delhi
5. Electronic Devices Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
6. Electronic Devices and Circuits by Millman & Halkias, McGraw Hill, New Delhi
7. Analog Electronics – II by DR Arora, Ishan Publication, Ambala
8. Electronic Devices and Circuits by JC Karhara, King India Publication, New Delhi
9. Electronic Devices and Circuits-I, Eagle Prakashan, Jalandhar



Electrical Engg. Design & Drawing-II

RATIONALE

A polytechnic pass-out in electrical engineering is supposed to have ability to :

- i) Read, understand and interpret engineering drawings
- ii) Communicate and correlate through sketches and drawings
- iii) Prepare working drawings of alternative panels, transmission and distribution

The contents of this subject has been designed to develop requisite knowledge and skills of electrical drawings in the students of diploma in electrical engineering.

DETAILED CONTENTS

Unit-I

Contractor Control Circuits

Design of Circuit Drawing of schematic diagram and power wiring diagram of following circuits, specification of contactors

- DOL starting of 3-phase induction motor
- Remote Control of 3-phase induction motor
- -phase induction motor getting supply from selected feeder
- Forwarding/reversing of a 3-phase induction motor
- Two speed control of 3-phase induction motor

Unit-II

- Limit switch control of a 3-phase induction motor
 - Sequential operating of two motors using time delay relay
 - Automatic star delta starter for 3-phase Induction Motor
- ##### Earthing
- Purpose of earthing
 - Different types of earthing, drawings of plate and pipe earthing

Unit-III

- Procedure of earthing, test of materials required and costing
- Method of reducing earth resistance
- Relevant IS specifications of earth electrode for earthing a transformer, a high building
- Earthing layout of distribution transformer

Unit-IV

- Substation earthing layout and earthing materials
- Key diagram of 11KV, 33KV, 66KV, 132 KV sub-stations

Drawings of Machine Parts

- End cover of induction motor
- Rotor of a squirrel cage induction motor

Unit-V

- Field coil of a DC motor
- Terminal plate of an induction motor
- Motor body (induction motor) as per IS specifications
- Sliprings of 3-phase induction motor

Reference Books:

1. Electrical Design and Drawings by Raina & Bhattacharya
2. Electrical Design & Drawings by Sarabjeet Singh
3. IEEE Guide 70 for Earthing, IEEE Publication, New York
5. Electrical Controls in Industry by Charles Siskind
6. BIS for Electrical Earthing



Estimating & Costing in Electrical Engg

RATIONALE

A diploma holder in electrical engineering should be familiar to Indian Standards and relevant Electricity Rules. Preparation of good estimates is a professional job, which requires knowledge of materials and methods and the principles of economics. The contents of this subject has been designed keeping in view developing requisite knowledge and skills of estimation and costing in students of diploma in electrical engineering.

DETAILED CONTENTS

Unit-I

1. Introduction

Purpose of estimating and costing, proforma for making estimates, preparation of material schedule costing, price list, tender document net price list, market survey, overhead charges, labour charges, electrical point method and fixed percentage method, contingency, profit, purchase system, enquiries, comparative statements, orders for supply, payment of bills. Tenders – its constituents, finalization specimen tender.

Unit-I

Types of wiring

Electrical, batten, casing-casing and conduit wiring, comparison of different wiring, selection and design of wiring schemes for particular situation (domestic and Industrial). Selection of wires and cables, wiring accessories and use of protective devices i.e. MCB, ELCB etc. Use of wire-gauge and tables.

Unit-III

Estimating and Costing:

- Domestic installations; standard practice as per IS and IE rules. Planning of circuits, sub-circuits and position of different accessories, electrical layout, preparing estimates including cost as per schedule rate pattern and actual market rate (single storey and multi-storey buildings)

Unit-IV

- Industrial installations; relevant IE rules and IS standard practices, planning, designing and estimation of installation for single phase motors of different ratings, electrical circuit diagram, sizing of diagram, starters, preparation of materials lists, estimating and costing exercises on workshop with single-phase, 3-phase motor load and the light load (3-phase supply system)
- Service line connection estimate for domestic and Industrial loads (over-head and under ground connections) from pole to energy meter. Electrical forms: different types of fans and their sizes, air-conditioners, exhaust fans, determination of size and number of fans for a given situation

Unit-V

- Transmission and distribution lines (overhead and underground) planning and designing of lines with different fixtures, earthing etc. based on unit cost calculations
- Substation: Types of substations, substation schemes and components, estimate of 11/0.4 KV pole mounted substation up to 200 KVA rating.

Note-Practical syllabus will be based on detailed syllabus.

Reference Books:

1. Electrical Estimating and Costing by JB Gupta, Satya Prakashan, New Delhi
2. Estimating and Costing by SK Bhattacharya, Tata McGraw Hill, New Delhi
3. Estimating and Costing by Surjeet Singh, Dhanpat Rai & Co., New Delhi
4. Estimating and Costing by Qurashi
5. Estimating and Costing by SL Uppal, Khanna Publishers, New Delhi
6. Electrical Estimating and Costing by N Alagappan and B Ekambaram, TMH, New Delhi



Electrical Workshop Practice-II

RATIONALE

An electrical diploma holder will be required to inspect, test and modify the work done by skilled workers or artisans working under him. In addition to these persons, many a times, it will become necessary for him to demonstrate the correct method and procedure of doing a job. In order to carry out this function effectively in addition to conceptual understanding of the method or procedure he must possess appropriate manual skills. The subject aims at developing special skills required for repairing, fault finding, wiring in electrical appliances and installations.

DETAILED CONTENTS

1. To carry out pipe/plate earthing for a small house and 3-phase induction motor. Testing the earthing using earth test
2. Connections of single phase and 3-phase motors, through an appropriate starter and to change their direction of rotation
3. Wiring, testing and fault finding of the following contactor control circuits operating on 3-phase supply:
 - c) Remote control circuits
 - d) Time delay circuits
 - e) Inter locking circuits
 - f) Sequential operation control circuits
7. Winding/re-winding of a fan (ceiling and table) and choke
8. Soldering and de-soldering practice (soldering and de-soldering of electronic components on PCB)
9. Power cable jointing using epoxy based jointing
10. Demonstration of laying of underground cables at worksite
11. Dismantling/assembly of star-delta/DOL starter and slipring induction motor starter
12. Dismantling and assembly of voltage stabilizers

RAIPUR



SEMESTER-V

RAIPUR

Electrical Machines -II

RATIONALE

Electrical machines is a subject where a student will deal with various types of electrical machines which are employed in industries, power stations, domestic and commercial appliances etc. After studying this subject, an electrical diploma holder must be competent to repair and maintain these machines and give suggestions to improve their performance. Explanation of practical aspects of the subject will make the students capable of performing various tests on the machines as per latest BIS specifications

DETAILED CONTENTS

Unit-I

Synchronous Machines

- Main constructional features of commutator and brushless excitation system
- Generation of three phase emf
- Production of rotating magnetic field in a three phase winding
- Concept of distribution factor and coil span factor and emf equation Armature reaction on unity, lag and lead power factor
- Operation of single synchronous machine independently supplying a load -Voltage regulation by synch-impedance method

Unit-II

- Need and necessary conditions of parallel operation of alternators Synchronizing an alternator (Synchroscope method) with the bus bars
- Operation of synchronous machine as a motor –its starting methods
- Effect of change in excitation of a synchronous motor
- Cause of hunting and prevention
- Rating and cooling of synchronous machines
- Applications of synchronous machines (as an alternator, as a synchronous condenser)

Unit-III

Induction Motors

- Salient constructional features of squirrel cage and slip ring 3-phase induction motors
- Principle of operation, slip and its significance and connection of submersible motor (monoblock)
- Locking of rotor and stator fields
- Rotor resistance, inductance, emf and current
- Relationship between copper loss and the motor slip
- Power flow diagram of an induction motor

Unit-IV

- Factors determining the torque
- Torque-slip curve, stable and unstable zones
- Effect of rotor resistance upon the torque slip relationship

- Double cage rotor motor and its applications
- Starting of 3-phase induction motors, DOL, star-delta, auto transformer
- Causes of low power factor of induction motors
- Testing of 3-phase motor on no load rotor test and find efficiency
- Speed control of induction motor, conventional and thyristorized

Unit-V

Fractional Kilo Watt (FKW) Motors

- Single phase induction motors; Construction characteristics and applications
- Nature of field produced in single phase induction motor
- Split phase induction motor
- Capacitors start and run motor
- Shaded pole motor
- Reluctance start motor
- Alternating current series motor and universal motors
- Single phase synchronous motor
- Reluctance motor
- Hysteresis motor

Special Purpose Machines

Construction and working principle, linear induction motor, stepper motor, schrage motor.

LIST OF PRACTICALS

1. Demonstration of revolving field set up by a 3-phase wound stator
2. To plot relationship between no load terminal voltage and excitation current in a synchronous generator at constant speed
3. Determination of the relationship between the voltage and load current of an alternator, keeping excitation and speed constant
4. Determination of the regulation and efficiency of alternator from the open circuit and short circuit test 111
5. Synchronization of polyphase alternators and load sharing
6. Determination of the effect of variation of excitation on performance of a synchronous motor
7. Study of ISI/BIS code for 3-phase induction motors
8. Perform at least two tests on a 3- phase induction motor as per BIS code
9. Determination of efficiency by (a) no load test and blocked rotor test on an induction motor (b) direct loading of an induction motor (refer BIS code)
10. Determination of effect of rotor resistance on torque speed curve of an induction motor
11. To study the effect of a capacitor on the starting and running of a single-phase induction motor by changing value of capacitor and also to reverse the direction of rotation of a single phase induction motor

Reference Books:

1. Electrical Machines by SK Bhattacharya, Tata Mc Graw Hill, New Delhi
2. Electrical Machines by SK Sahdev, Unique International Publications, Jalandhar
3. Electrical Machines by Nagrath and Kothari, Tata Mc Graw Hill, New Delhi
4. Electrical Engineering by JB Gupta, SK Kataria & sons, New Delhi

Power-I

RATIONALE

The majority of the polytechnic passouts have to perform various activities in the State Electricity Boards in the field of Generation, Transmission and Distribution of Electrical power. The range of these activities vary from simple operation and maintenance of equipment, lines, fault location, planning and designing of simple distribution schemes, executive and supervisory control in power stations, transmission and distribution networks in addition to administrative jobs to public relations. They should also be made aware of recent developments, current practices in the electricity departments, corporations and boards to keep them abreast with modern techniques in Generation, Transmission and Distribution of Electrical Power.

DETAILED CONTENTS

Unit-I

Power Generation

- Main resources of energy, conventional and non-conventional
- Different types of power stations, thermal, hydro, gas, diesel and nuclear power stations. Flow diagrams and brief details of their operation, comparison of the generating stations on the basis of running cost, site, starting, maintenance etc.
- Importance of non-conventional sources of energy in the present scenario. Brief details of solar energy, bio-energy, wind energy

Unit-II

Transmission Systems

- Layout of transmission system, selection of voltage for H.T and L.T lines, advantages of high voltage for Transmission both AC and DC
- Comparison of different system: AC versus DC for power transmission, conductor material and sizes from table
- Constructional features of transmission lines: Types of supports, types of insulators, Selection of insulators, conductors, earth wire and their accessories, Transposition and string efficiency of lines
- Mechanical features of line: Importance of sag, calculation of sag, effects of wind and ice and related problems; Indian electricity rules pertaining to clearance
- Electrical features of line: Calculation of resistance, inductance and capacitance without derivation in a.c. transmission line, voltage regulation concept of corona. Effects of corona and remedial measures

Unit-III

Distribution System

- Lay out of HT and LT distribution system, constructional feature of distribution lines and their erection. LT feeders and service mains; Simple problems on AC radial distribution system, determination of size of conductor
- Construction of LT and HT power cables advantages/disadvantages
- Preparation of estimates for LT and HT overhead distribution lines.
- Calculation of line losses in distribution system

Unit-IV

Substations:

- Brief idea about substations; outdoor grid sub-station 220/132 KV, 66/33 KV outdoor substations, pole mounted substations and indoor substation
- Layout of 33/11 KV distribution substation and various auxiliaries and equipment associated with it
- Preparation of estimates for 11 KV/0.4 KV substations (pole mounted)

Faults:

- Common type of faults in both overhead and underground systems

Unit-V

Power Factor:

- Concept of power factor
- Reasons and disadvantages of low power factor
- Methods for improvement of power factor using capacitor banks

Various Types of Tariffs:

- Tariffs
- Block rate, flat rate, maximum demand and two part tariffs
- Simple problems

Field Visits

Reference Books:

1. Electrical Power System and Analysis by CL Wadhwa, 3rd edition, New Age International Publishers, New Delhi
2. Substation Design and Equipment by Satnam and PV Gupta, Dhanpat Rai & Sons, New Delhi
3. Electrical Power –I by SK Sahdev, Unique International Publications, Jalandhar
4. Electrical Power System by VK Mehta, S Chand & CO., New Delhi
5. Electrical Power System by JB Gupta, Kataria and Sons, New Delhi
6. Sub-Station Design by Satnam, Dhanpat Rai and Co., New Delhi
7. Electrical Power Distribution System by AS Pabla, Tata McGraw Hill, New Delhi

RAIPUR

Industrial Electronics & Control of Drives

RATIONALE

Industrial electronics plays a very vital role in the field of control engineering specifically in the modern industries as they mostly use electronic controls which are more efficient, effective and precise as compared to the conventional method. The old magnetic and electrical control schemes have all become obsolete. Electrical diploma holders many times have to maintain the panels used in the modern control process. Therefore, the knowledge of components like thyristors and other semiconductor devices used in such control electronics is a must for them in order to supervise the work efficiently and effectively. Looking into its usefulness and importance to the subject, this has been incorporated in the curriculum.

DETAILED CONTENTS

Unit-I

Introduction to SCR

- Construction and working principles of an SCR, two transistor analogy circuit and characteristics of SCR
- SCR specifications and rating
- Construction, working principles and V-I characteristics of DIAC and TRIAC
- Basic idea about the selection of heat sinks for SCR and TRIACS
- Methods of triggering a Thyristor. Study of triggering circuits
- . UJT, its Construction, working principles and VI characteristics, UJT relaxation oscillator
- Commutation of Thyristors
- . Series and parallel operation of Thyristor
- Applications of SCR and TRIACS such as light intensity control, control of DC and universal motor, fan regulator, battery charger etc.

Unit-II

Controlled Rectifiers

- Single phase half wave controlled rectifier with resistive load and inductive load
- Single phase half controlled full wave rectifier
- Fully controlled full wave rectifier bridge
- Single phase full wave centre tap rectifier
- Three phase full wave half controlled bridge rectifier
- Three phase full wave fully controlled bridge rectifier

Unit-III

Inverters, choppers, dual converters and cyclo converters

- Inverter-introduction, working principles, voltage and current driven in series and parallel inverters and applications
- Choppers introduction, types of choppers and their working principles and applications
- Dual Converters-introduction, types of cyclo-converters, working principles and applications
- Cyclo-converters-introduction, types, working principles and applications

Unit-IV

Thyristor control of electric drives

- DC drives control
- Half wave drives
- Full wave drives
- Chopper drives
- AC drives control
- Phase control
- Variable frequency a.c. drives
- Constant V/F appreciation
- Voltage controlled inverter drives
- Constant current inverter drives
- Cyclo convertors controlled AC drives
- Slip control AC drives

Unit-V

Uninterrupted power supplies

- UPS, online, stand by, Redundant UPS, DC UPS
- Storage devices, battery charger with UPS

Static Control of Machines

Advantages and disadvantages of static control compared to magnetic control. Development of simple control circuits using logic gates, off-return and retentive memory elements. Input and output devices for solid state logic circuits. Study of some industrial control circuits like product dispersion, product inspection conveyor system etc. using shift registers, counters, decoder, mono shot, clock, down counter and encoder.

Programmable Logic Controllers

Parts of a programmable controller, inputs/output section, central processing unit, input image table, output image table, user program memory, variable data memory, complete scan cycle, the programming terminals, programming basics, relay, timer, Counter and Sequencer type instructions, analog operation.

Note- Practical syllabus will be based on detailed syllabus.

Reference Books:

1. Control of Electrical Machines by S.K. Bhattacharya and Brijinder Singh. Tata Mc Graw Hill, New Delhi
2. Industrial Control Electronics. John Webb, Kevin Greshock, Maxwell, Macmillan International editions.
3. Fundamentals of Power Electronics by S Rama Reddi, Narosa Publishing House Pvt. Ltd, New Delhi
4. Power Electronics, Circuits Devices and Applications by Mohammad H. Rashid
5. Power Electronics by PC Sen
6. Power Electronics by Dr. PS Bhimbra, Khanna Publishers, New Delhi
7. Industrial Electronics & Control by SK Bhattacharya & S Chatterji, New Age international Publications (P) Ltd, New Delhi
8. Power Electronics by SK Sahdev, Unique International Publication, Jalandhar
9. Power Electronics by JC Karhava, King India Publication,

10. Fundamentals of Electrical Devices by Gopal K Dubey, Narosa Publishing House Pvt. Ltd, New Delhi

11. Power Electronics and Controls by Samir K Datta, Prentice Hall of India, New Delhi



RAIPUR

PC Maintenance & Repair

RATIONALE

The PC is the tool that defines today current age and culture. A right understanding about any tools required to use it effectively. There has been a complete revolution in this area because of rapid advancement in the field of electronics. The PC is the most logical and modern machine and is no more difficult to understand its function. It is very important to learn the various components of PC and how these parts work together. All technically trained individuals must understand the general nature of PC operation of memory, I/O techniques, interfacing applications etc. Looking at the importance and usefulness, this subject has been included in the curriculum.

DETAILED CONTENTS

Unit-I

Introduction

- Origin of PC
- Hardware and software
- Operating system
- Programming language

Unit-II

Hardware Components

- Motherboard
- Microprocessors and Co-processors
- Memory – ROM, RAM
- Chipsets and support circuits, its function, system control, peripheral control and memory control
- Bus-architecture, function and various buses i.e. ISA, EISA, VESA, PCI
- Mass storage device i.e. hard disk, floppy disk, compact disk
- Input/output devices i.e. keyboard, mouse, display system. Video adapter, audioprinters, modems, serial and parallel ports, IEEE 1284, RS-232-C
- General information about computer virus and anti-virus

Unit-III

Interfacing Components and Techniques

- Interface systems and standards
- Programmable peripherals interface (PPI) Chip-8255, 8155
- Pin diagrams and programming

Unit-IV

-Networking Topologies Standards, Cabling and Configuration, IEEE Standards for LANS

-Concept of Internet

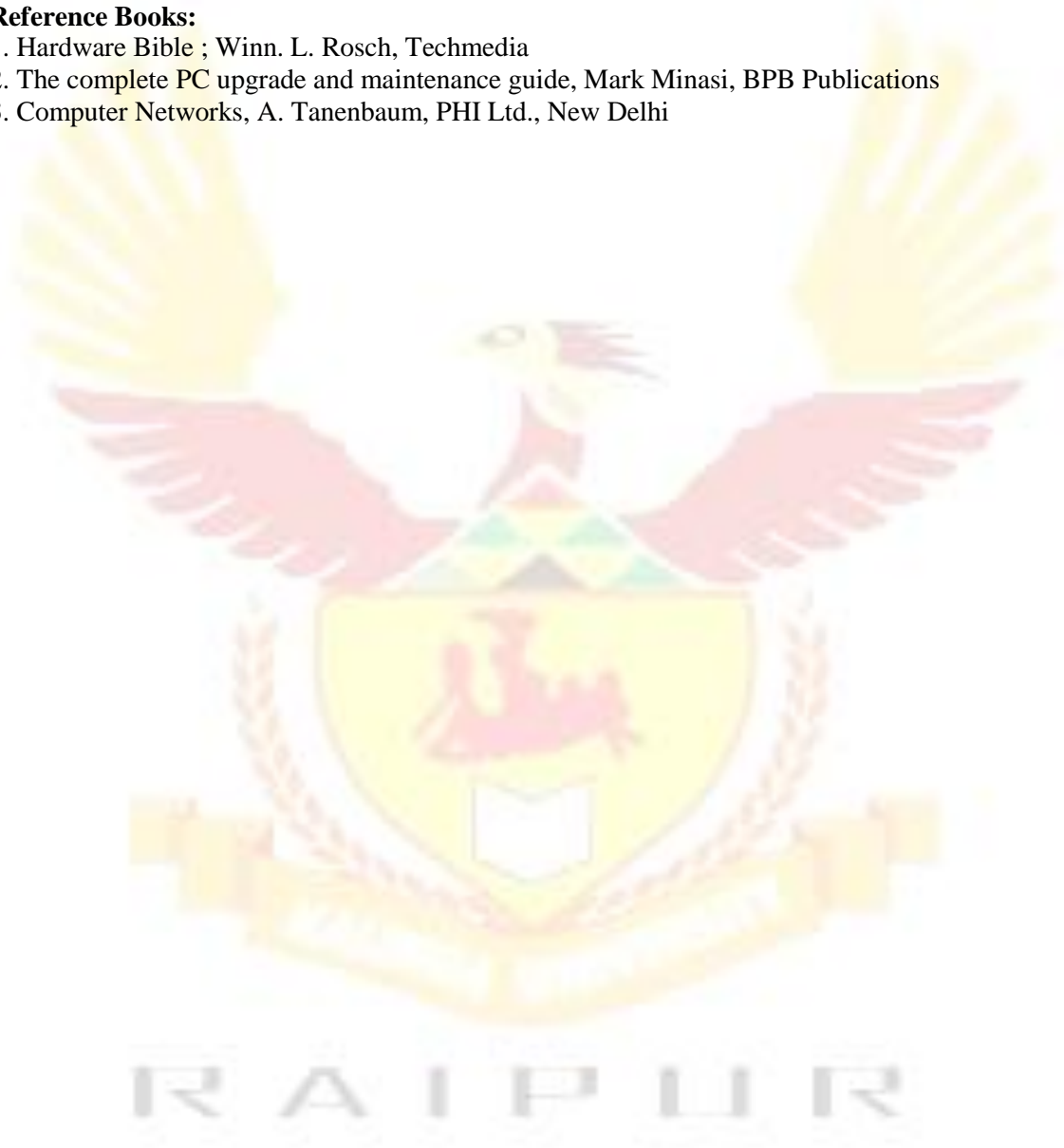
- Internet Protocols H.T.T.P.

Unit-V

- Simple Networking Management Protocol (SNMP)
- Domain Name Systems (DNS)
- Security
- Electronic Mail
- World Wide Web
- Concept of ATM Networks

Reference Books:

1. Hardware Bible ; Winn. L. Rosch, Techmedia
2. The complete PC upgrade and maintenance guide, Mark Minasi, BPB Publications
3. Computer Networks, A. Tanenbaum, PHI Ltd., New Delhi



Digital Electronics & Microprocessor

RATIONALE

Digital electronics has made extremely rapid advances in the last five decades. It has important applications in communication entertainment, instrumentation, control, automation etc. Thus it appears that there is no end to its usefulness in the light and the new world belongs to it. So it is necessary to give the knowledge of digital electronics to the students. Microprocessor is one of the most exciting technological among the semiconductor devices in recent times. It has a tremendous impact on the Industrial processes due to its high reliability and flexibility both at the design and the Implementation stages. The decreasing cost of with increasing facilities act as catalysts in widening their scope of applications.

DETAILED CONTENTS

Unit-I

Number Systems

- Decimal, binary, octal and hexa-decimal number systems and their interconversion
- Binary addition, subtraction and multiplication
- 1's and 2's complement methods of addition/subtraction

Gates

- Definition, symbol and truth tables for inverter, OR, AND, NAND, NOR and X-OR gates

Boolean algebra

- Boolean Relations
- DeMorgan's Law
- K-Map upto four variables

Unit-II

Combinational Circuits

- Half adder, Full adder
- Encoder, Decoder
- Multiplexer/Demultiplexer
- Display Devices (LED, LCD and 7-segment display)

Unit-III

Flip-Flops

- J-K Flip-Flop
- R-S Flip-Flop
- D-Type Flip-Flop
- T-Type Flip-Flop
- Applications of Flip-Flops

A/D and D/A Converters

- D/A converters (Binary weighted, R-2R D/A Converter)
- A/D converter (Counter ramp, successive approximation method of A/D Conversion)

Unit-IV

Semi-conductor Memories

Microprocessor

- Study 7085 microprocessor architecture, pin configuration, bus organisation, registers flags, interrupts
- Instruction set of 7085 microprocessor, addressing modes, instruction format. Writing some simple assembly language programmes. Use of stacks and subroutines in programming
- Interfacing and data transfer between peripheral, I/O and microprocessor
- Study of peripheral chips – 8255, 8253, 9155
- Introduction of 16-bit, 32-bit microprocessor, their advantages over 8-bit microprocessor
- Concept of 7086 and 67000 microprocessors

Unit-V

Introduction to Microcontrollers

- Different between microprocessor and microcontroller
- Architecture of 7031 and 7051 varieties of microprocessor

Programmable Logic Controller (PLC)

- Introduction to PLC
- Basic configuration of PLC
- Comparison of logic controller

Note- Practical syllabus will be based on detailed syllabus

Reference Books:

1. Modern Digital Electronics by RP Jain
2. Digital Principles and Electronics by Malvino & Leach
3. Digital Electronics by RL Rokheine
4. Digital Electronics by SN Ali
5. Microprocessor by Goanker, Wiley Eastern Ltd. New Delhi
6. Digital Electronics by T.L. Foyal
7. Digital Electronics by Jamwal
8. Microprocessors Architecture, Programming and Application with 7085/7070A, RSGaonkar, Wiley Eastern Ltd. New Delhi
9. Introduction to Microprocessors by Aditya Mathur, TMH Publishing Co., New Delhi

RAIPUR

Industrial Training

Industrial Training aims at exposing the students to field practices, size and scale of operation and work culture at practical sites. For this purpose, students at the end of fourth semester are required to be sent for a period of 4 weeks to industry. Each student is supposed to study the material and technology used at site and prepares a detailed report of the observation of process seen by him/her. These students should be supervised and guided by respective subject teachers. Each teacher may guide a group of four to five students. The teacher along with field supervisors will conduct performance assessment of students.

The components of evaluation will include the following.

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





SEMESTER-VI

RAIPUR

Utilization of Electrical Energy

RATIONALE

This subject assumes importance in view of the fact that a technician has to work in a wide spectrum of activities wherein he has to make selections from alternative schemes from technical and economical considerations; i.e. to plan and design using basic principles and handbooks, to select equipment, processes and components in different situations. The curriculum has been designed keeping the above objectives in view. Besides giving him basic knowledge in the topics concerned, attempts have been made to ensure that the knowledge acquired is applied in various fields as per his job requirements. To orient the subject matter in the proper direction, visits to industrial establishments are Reference in order to familiarize the students with the new developments in different areas

DETAILED CONTENTS

Unit-I

Electric Drives:

- Advantages of electric drives
- Characteristics of different mechanical loads
- Types of motors used in electric drive
- Electric braking
 - Plugging
 - Rheostat braking
 - Regenerative braking
- Methods of power transfer by direct coupling by using devices like belt drive, gears, pulley drives etc.
- Examples of selection of motors for different types of domestic loads
- Selection of drive for applications such as general workshop, textile mill, paper mill, steel mill, printing press, crane and lift etc. Application of flywheel.
- Specifications of commonly used motors e.g. squirrel cage, slip ring induction motors, AC series motors, FKW motors

Illumination:

- Nature of light, visibility spectrum curve of relative sensitivity of human eye and wave length of light
- Definition: Luminous flux, solid angle, luminous intensity, illumination, luminous efficiency, depreciation factor, coefficient of utilization, space to height ratio, reflection factor, glare, shadow, lux.
- Laws of illumination - simple numericals
- Different type of lamps, construction and working of incandescent and discharge lamps – their characteristics, fittings required for filament lamp, mercury vapour lamp, fluorescent lamp, metal halide lamp, neon lamp.

Unit-II

- Calculation of number of light points for interior illumination, calculation of illumination at different points, considerations involved in simple design problems. Illumination schemes; indoor and outdoor. Illumination levels
- Main requirements of proper lighting; absence of glare, contrast and shadow
- General ideas about street lighting, flood lighting, monument lighting and decorative lighting, light characteristics etc.

Electric Heating

- Advantages of electrical heating
- Heating methods:
 - Resistance heating – direct and indirect resistance heating, electric covers, their temperature range, properties of resistance heating elements, domestic water heaters and other heating appliances and thermostat control circuit
 - Induction heating; principle of core type and coreless induction furnace
 - Electric arc heating; direct and indirect arc heating, construction, working and applications of arc furnace
 - Dielectric heating, applications in various industrial fields
 - Infra-red heating and its applications
 - Microwave heating
- Simple design problems of resistance heating element

Unit-III

Electric Welding:

- Advantages of electric welding
- Welding method
 - Principles of resistance welding, types – spot, projection seam and butt welding and welding equipments used
 - Principle of arc production, electric arc welding, characteristics of arc; carbon arc, metal arc, hydrogen arc welding method of and their applications. Power supply required. Advantages of using coated electrodes, comparison between AC and DC arc welding, welding control circuits, welding of aluminum and copper
- Introduction to TIG, MIG Welding

Unit-IV

Electrolytic Processes:

- Need of electro-deposition
- Laws of electrolysis, process of electro-deposition - clearing, operation, deposition of metals, polishing, buffing
- Equipment and accessories for electroplating
- Factors affecting electro-deposition
- Principle of galvanizing and its applications
- Principles of anodising and its applications
- Electroplating on non-conducting materials
- Manufacture of chemicals by electrolytic process
- Manufacturing of chemicals by electrolysis process

Electrical Circuits used in Refrigeration and Air Conditioning and Water Coolers:

- Principle of air conditioning, vapour pressure, refrigeration cycle, eco-friendly refrigerants
- Description of Electrical circuit used in
 - a) refrigerator,
 - b) Air-conditioner, and
 - c) Water cooler

Unit-V

Electric Traction:

- Advantages of electric traction
- Different systems of electric traction, DC and AC systems, diesel electric system, types of services – urban, sub-urban, and main lines and their speed-time curves
- Different accessories for track electrification; such as overhead capacitor wire, conductor rail system, current collector-pentagraph
- Factors affecting scheduled speed
- Electrical block diagram of an electric locomotive with description of various equipment and accessories
- Types of motors used for electric traction
- Starting and braking of traction motors
- Introduction to EMU and metro railways

Reference Books:

1. Art and Science of Utilization of Electrical Energy by H Partap, Dhanpat Rai & Sons, Delhi
2. Utilization of Electrical Energy by JB Gupta, Kataria Publications, Ludhiana
3. A. Text Book. of Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi
4. Modern Electric Traction by H Partap, Dhanpat Rai & Sons, Delhi
5. Utilization of Electrical Energy by OS Taylor, Pitman Publications
6. Generation, Distribution and Utilization of Electrical Power by CL Wadhwa, Wiley Eastern Ltd., New Delhi



RAIPUR

Installation of Maintenance of Electrical equipment

RATIONALE

In his career as a supervisor, an electrical engineering technician will be called upon to inspect, test and modify the work done by skilled workers or artisans working under him. Many a times it will become necessary for him to demonstrate the correct method and procedure of doing certain operations. Normally manufacturers of heavy electrical equipment provide service manuals, instructions for installation, maintenance and fault location. Indian Electricity Rules and Indian Standard Specifications also provide enough guidelines. This syllabus has been designed to provide certain guidelines and broad principles regarding the above activities. Appropriate field trips will reinforce the learning.

DETAILED CONTENTS

Unit-I

Tools, accessories and instruments required for installation, maintenance and repair work

- Knowledge of Indian Electricity rules, safety codes causes and prevention of accidents, artificial respiration, workmen's safety devices

Installation

- Installation of transmission and Distribution Lines:
- Erection of steel structures, connecting of jumpers, tee-off points, joints and deadends; crossing of roads, streets, power/telecommunication lines and railway crossings, clearances; earthing of transmission lines and guarding, spacing and configuration of conductors: Arrangement for suspension and strain insulators, birdguards, anti-climbing devices and danger plates; sizes of conductor, earthwire and guy wires, Testing and Commissioning.
- Laying of service lines, earthing, provision of service fuses, installation of energy meters

Unit-II

- **Laying of Underground Cables:**
Inspection, storage, transportation and handling of cables, cable handling equipment, cable laying depths and clearances from other services such as: water, sewerage, gas, heating and other mains, and also a series of power and telecommunication cables and coordination with these services, excavation of trenches, direct cable laying (including laying of cable from the drum, laying cable in the trench, taking all measurements and making as installed drawings, backfilling of trenches with earth or sand, laying protective layer of bricks etc), laying of cables into pipes and conduits and within buildings, introduction to cable filling compounds, epoxy resins and hardeners, cable jointing and terminations, testing and commissioning.
- Elementary idea regarding, inspection and handling of transformers; Pole mounted substations, plinth mounted substations, grid substation, busbars, isolation, voltage and current transformers, lightning arrestors, control and relay panels, HT/LT circuit breakers, LT switches, installation of power/distribution transformers, dehydration. Earthing system, fencing of yard, equipment foundations and trenches.

Unit-III

- Testing of various electrical equipment such as electrical motor, transformers, cables and generator and motor control centres, medium voltage distribution panels, power control centres, motor control centres, lighting arrangement, storage, pre-installation checks, connecting and starting, pre-commissioning checks, drying out.

Maintenance

- Types of maintenance, maintenance schedules, procedures
- Maintenance of Transmission and Distribution System Authorized persons, danger notice, caution notice, permit to work, arranging of shutdowns personally and temporary earths cancellation of permit and restoration of supply.
- Patrolling and visual inspection of lines - points to be noted during patrolling from ground; special inspections and night inspections.

Unit-IV

- Location of faults using Meggar, effect of open or loose neutral connections, provision of proper fuses on service lines and their effect on system, causes and dim and flickering lights.
- Maintenance of Distribution Transformers Transformer maintenance and points to be attended to in respect of various items of equipment Checking of insulation resistance, transformer oil level and BDV test of oil, measurement of earth resistance
- Maintenance of Grid Substations Checking and maintenance of busbars, isolating switches, HT/LT circuit breakers, LT switches. Power transformers

Unit-V

- Maintenance of Motors

Overhauling of motors, preventive maintenance, trouble shooting of electric motors

- Domestic Installation

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

LIST OF PRACTICALS

1. Identification of tools and equipment
2. Giving exposure to students at actual sites
3. Study of codes and practices

Reference Books:

1. Testing, Commissioning, Operation and Maintenance of Electrical Equipment by S Rao, Khanna Technical Publication, New Delhi
2. Preventive Maintenance of Electrical Apparatus by SK Sharotri, Katson Publishing House, Ludhiana

DIEE603

Power-II

RATIONALE

In view of the complexities associated with the modern interconnected power stations, the responsibilities and the job requirements of a diploma pass out have become more complex than what they used to be earlier. He is required to work with modern electrical equipment and maintain reliability of supply. The course is designed to understand the concepts, principles involved in the construction and working of generating stations and protective switch gear system so that one can handle, install, maintain them and also take decisions at his/her level in different situations. The teaching of this subject requires reinforcement in the form of visits to substation, power stations and well designed laboratory experiences. A practice-oriented approach to the teaching of this subject is suggested.

DETAILED CONTENTS

Unit-I

Power System Faults

Types of faults, single line to ground, double line to ground, three phase to ground, open conductors, severity of faults and their effects on system

Unit-II

Switch gears

- Purpose of protective gear. Difference between switch, isolator and circuit breakers. Function of isolator and circuit breaker. Making and breaking capacity of circuit breaker (only definition)
- Principles of Arc extinction by OCB and ACB, Constructional features of OCB,ACB, and their working,
- Circuit breakers. Types of circuit breakers, bulk and minimum oil circuit breakers, air blast circuit breakers, SF₆ circuit breakers
- Miniature circuit breakers ACB, ELCB, MCB, for distribution and transmission system (Descriptive)

Unit-III

Protection Devices

- Fuses; function of fuse. Types of fuses, HV and LV fuses, rewire-able, cartridge,HRC
- Earthing, purpose of earthing: Equipment earthing, Substation earthing, system earthing as per Indian Electricity rules.
- Relays:

- a) Introduction, types of relays. Electromagnetic and thermal relays, their construction and working
- b) Induction type over-current, earth fault relays, instantaneous over current relay
- c) Directional over-current, differential relays, their functions
- d) Idea of static relays and their applications.

Unit-IV

Protection Scheme

- Relays for generator protection
- Relays for transformer, protection including Buchholz relay protection
- Protection of feeders and bus bars. Over current and earth fault protection, distance protection
- Relays for motor protection

Unit-V

Over-voltage Protection

- Protection of system against over voltage; causes of over voltage, function of ground wire
- Lightning arrestors, Rod gap, horn gap, metal oxide type.
- Line protection

LIST OF PRACTICALS

Visit to power station/sub station for the conduct of following practical work:

1. Testing of the dielectric strength of transformer oil and air
2. Study of different types of circuit breakers and isolators
3. Plot the time current characteristics of over current relay
4. Power measurement by using CTs and PTs
5. Earthing of different equipment/Main Distribution Board and Energy Meter Box
6. Perform the overload and short circuit test of MCB as per IS specifications
7. Plot the time-current characteristics of Kit-Kat fuse wire
8. Taking reading of current on any LT line with clip on meter

Reference Books:

1. Testing, Commissioning, Operation and Maintenance of Electrical Equipment by S Rao, Khanna Technical Publication, New Delhi
2. Electrical Power Systems by CL Wadhwa, Wiley Eastern Ltd., New Delhi
3. Textbook of Electrical Technology by BL Theraja, S Chand and Co., New Delhi
4. Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi
5. A Course in Electrical Power by ML Soni, PV Gupta and Bhatnagar, Dhanpat Rai & Sons, New Delhi
6. Principles of Power Systems by VK Mehta, S Chand and Co., New Delhi
7. Preventive Maintenance of Electrical Apparatus by SK Sharotri, Katson Publishing House, Ludhiana

DIEE604

Energy Management

RATIONALE

One of the reasons for India not been able to catch up with the desired extent of modernization of industrial processes in light of challenges posed by multinationals is the non-availability of required energy supply. The solution primarily lies in tapping all possible energy generation sources but efficient use of available energy is also important. Energy management focuses on these aspects and the course will develop a awareness amongst the diploma engineers and will enable them to practice the energy management techniques in whatever field they are engaged in.

DETAILED CONTENTS

Unit-I

Energy Management

- Overview of energy management, need for energy conservation, (Started with oil crisis) Environmental Aspects, Alternative sources of energy.
- Need for Energy conservation with brief description of oil and coal crisis.
- Environmental aspects
- Alternate sources of energy.
- Energy efficiency- its significance

Unit-II

Energy Conservation

- Energy conservation in Domestic Sector- Lighting, home appliances
- Energy conservation in Industrial sector- Motors, Industrial lighting Distribution system, Pumps, Fans, Blowers etc.,
- Energy conservation in Agriculture sector Tubewell pumps, diesel-generating sets, standby energy sources.

- Macro Level approach for energy conservation at design stage.

Unit-III

Energy Efficient Devices

- Need for energy efficient devices
- Initial cost versus life cycle, cost analysis on life cycle basis
- Energy efficient motors as compared to standard motors.
- BIS specification for energy efficient motors, Salient design features,
- Efficiency as a function of load, safety margins
- Energy efficient lighting system different sources, lumens/watt, LEDs, role of voltage on efficiency
- Distribution system- Optimum cable size, amorphous core transformer, role of power factor, use of compensating capacitors-manual and automatic, location of capacitors.

Unit-IV

Energy Audit

- Energy Audit Methodology
- Efficiency of energy conversion processes, monitoring system
- Specific energy consumption –three pronged approach, fine tuning, technical up gradation, avoidable losses.
- Case studies of energy audit of distribution system, AC motors, Industries.
- Organisation of energy audit activities.

Unit-V

- Environmental impact assessment
- Need for Environmental impact Assessment
- Standard format for assessment and its completion
- Evaluation of the assessment.

List of Experiment

1. To calibrate single Phase energy meter by direct loading method.
2. To study the energy audit for a any educational building.
3. To study the energy conversion process for solar energy to electrical energy.
4. To study the different alternative source of energy.
5. To study the energy conservation in Industrial sectors.
6. To study the energy conservation in agricultural sectors.
7. To design and study the energy efficient lighting system using LED
8. To design and study the conversion system using LDR.
9. To study and analysis of lighting and lighting arrestor.
10. To study the single phase transformer for energy conservation.

Reference Books:

1. Manual on energy efficiency at design stage, CII energy management cell.
2. Manual on energy efficiency in pumping system, CII energy management cell.
3. Manual on variable speed drives for energy efficiency CII energy management cell.
4. Energy conservation case studies in ceramic industry, sugar industry, fertiliser industry, cement industry. CII, Energy Management Cell etc
DIEE605

Entrepreneurship Development & Management

RATIONALE

Entrepreneurship Development and Management is one of the core competencies of technical human resource. Creating awareness regarding entrepreneurial traits, entrepreneurial support system, opportunity identification, project report preparation and understanding of legal and managerial aspects can be helpful in motivating technical/ vocational stream students to start their own small scale business/enterprise. Based on the broad competencies listed above, following detailed contents are arrived to develop the stated competencies.

DETAILED CONTENTS**Unit-I****Entrepreneurship**

- Concept/Meaning
- Need
- Competencies/qualities of an entrepreneur

Entrepreneurial Support System

- District Industry Centres (DICs)
- Commercial Banks
- State Financial Corporations
- Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State level

Unit-II**Market Survey and Opportunity Identification (Business Planning)**

- How to start a small scale industry
- Procedures for registration of small scale industry
- List of items reserved for exclusive manufacture in small scale industry
- Assessment of demand and supply in potential areas of growth
- Understanding business opportunity
- Considerations in product selection
- Data collection for setting up small ventures

Unit-III**Project Report Preparation**

- Preliminary Project Report
- Techno-Economic feasibility report
- Project Viability

Managerial Aspects of Small Business

- Principles of Management (Definition, functions of management viz planning, organisation, coordination and control)
- Operational Aspects of Production
- Inventory Management
- Basic principles of financial management
- Marketing Techniques
- Personnel Management
- Importance of Communication in business

Unit-IV

Legal Aspects of Small Business

- Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules
- Factory Act and Payment of Wages Act

Environmental considerations

- Concept of ecology and environment
- Factors contributing to Air, Water, Noise pollution
- Air, water and noise pollution standards and control
- Personal Protection Equipment (PPEs) for safety at work places

Unit-V

Motivation

- Factors determining motivation
- Characteristics of motivation
- Methods of improving motivation
- Incentives – pay, promotion, rewards

Leadership

- Need for leadership
- Functions of a leader
- Factors to be considered for accomplishing effective leadership

REFERENCE BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; AapgaPublications, Panchkula (Haryana)
2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi
4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan, New Delhi
5. Thakur Kailash, Environmental Protection Law and policy in India: Deep and DeepPublications, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi.
9. Principles of Management by Philip Kotler TEE Publication

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Major Project Work

Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The students should identify or given project assignment at least two to three months in advance. The project work identified in collaboration with industry should be preferred. Each teacher is expected to guide the project work of 5-6 students. The project assignments may consist of :

- a) Projects related with repair and maintenance of machine parts
- b) Estimating and costing projects
- c) Design of components/ parts/ jigs / fixtures
- d) Projects related to quality control
- e) Project work related to increasing productivity
- f) Project connected with work study
- g) Projects relating to erection, installation, calibration and testing
- g) Projects related to wastage reduction
- h) Progress related to energy audit

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