

## SEMESTER I

Course Title: English and Communication Skills-I

Course Code: CE/EE/ME/ECE-101

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### Objective

Language is the most commonly used 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 skills to communicate effectively to handle the future jobs in industry. The objective of this subject is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the subject, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.

### UNIT 1

#### Facets of Literature-I (Short Stories & Poems)

Short Stories:

1. Homecoming – R.N. Tagore
2. The Selfish Giant - Oscar Wilde
3. The Diamond Necklace- Guy- De Maupassant

Poems:

1. Ozymandias – P.B. Shelley
2. Daffodils – William Wordsworth
3. Stopping by Woods on a Snowy Evening – Robert Frost

### UNIT 1I

#### Facets of Literature-II (Prose)

1. I Have A Dream – Martin Luther King
2. On Habits – A. G. Gardiner
3. On Seeing People Off – Max Beerbohm

### UNIT III

#### Grammar and Usage

Parts of speech:

Nouns, Pronouns, Adjectives, Articles, Verbs, Adverbs, Prepositions, Interjection. Identifying parts of speech, Structures: Verb patterns and Question tags, Subject – Verb agreement (concord)

Pair of words (Words commonly confused and misused):

Tenses, Correction of incorrect sentences, One word Substitution

## UNIT IV

### Translation, Paragraph and Compression

Translation of Glossary of Administrative Terms from English into Urdu/Hindi, Translation from Urdu/Hindi into English.

Paragraph of 100-150 words from outlines

Comprehension: Unseen passages of literacy, scientific, data/graph based for comprehension exercises.

## UNIT V

### Communication

Definition, Introduction and Process of Communication

Objectives of Communication.

Notices

## REFERENCES

1. English and Communication Skills, Book-I By Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Singla, Prescribed by NITTTR, Chandigarh Published By Abhishek Publication, 57-59, Sector-17, Chandigarh.
- 0 Essentials of Business Communication by Pal and Rorualling; Sultan Chand and Sons.
- 1 The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India.
- 2 New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh, .
- 3 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, .
- 4 A Practical English Grammar by Thomson and Marlinet.
- 5 Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill.
- 6 English Conversation Practice by Grount Taylor; Tata McGraw Hill.
- 7 Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi.
- 8 Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi.
- 9 Communication Skills by Ms R Datta Roy and KK Dhir; Vishal Publication, Jalandhar

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

## SEMESTER I

Course Title: Applied Mathematics-I

Course Code: CE/EE/ME/ECE-102

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### **Objective**

Applied Mathematics forms the backbone of engineering students. Basic elements of algebra, trigonometry, coordinate geometry have been included in the curriculum as foundation course. This course will develop analytical abilities to make exact calculations and will provide continuing educational base to the students.

### **UNIT 1**

#### **Algebra**

Arithmetic progression, its  $n$ th term, sum of  $n$  terms with their applications to engineering problems. Geometrical progression, its  $n$ th term and sum of  $n$  terms and to infinity with application to engineering problems; Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors excluding repeated factors)

### **UNIT II**

#### **Permutations, Combinations & Binomial Theorem**

Concept of permutations and Combinations: Value of  ${}^n P_r$   ${}^n C_r$ .

Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof)

### **UNIT III**

#### **Trigonometry**

Concept of angles, measurement of angles in degrees, grades and radians and their conversions.

Review of ratios of some standard angles (0, 30, 45, 60, 90 degrees), T-Ratios of Allied angles (without proof), Sum, difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2).

### **UNIT IV**

#### **Co-Ordinate Geometry-I**

Cartesian and Polar coordinates (two dimensional), conversion from Cartesian to polar coordinates and vice-versa, distance between two points (Cartesian co-ordinates), section formulae.

Area of triangle when its vertices are given, co-ordinates of centroid, in center of a triangle when the vertices are given, simple problems on locus.

## UNIT V

### Co-Ordinate Geometry-II

Equation of straight line in various standard forms (without proof), intersection of two straight lines, angle between two lines, perpendicular distance formula (without proof)

General equation of a circle and its characteristics.

To find the equation of a circle, given:

- \* Centre and radius
- \* Three points lying on it
- \* Coordinates of end points of a diameter

## REFERENCES

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
3. Applied Mathematics by Dr. RD Sharma
4. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar.
5. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
6. Engineering Mathematics by Dass Gupta
7. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
8. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
9. Engineering Mathematics, Vol I, II & III by V Sundaram et.al, Vikas Publishing House (P) Ltd., New Delhi
10. Engineering Mathematics by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
11. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
12. Engineering Mathematics, Vol I & II by AK Gupta, MacMillan India Ltd., New Delhi.

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

## SEMESTER I

Course Title: Applied Physics-I  
Course Code: CE/EE/ME/ECE-103  
L T P  
4 0 0

Max. Marks: 100  
External: 60  
Internal Assessment: 40  
Duration of Exam: 3 Hrs

### **Objective**

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

*Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles*

### **UNIT 1**

#### **Units and Dimensions**

Physical quantities, Fundamental and derived units, Systems of units (CGS, MKS and SI units), Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, gravitational constant, density). Coefficient of viscosity, stress, strain and elasticity)

Principle of homogeneity

Uses of Units and Dimensions:

- (a) Conversion of one system of unit into another
- (b) Determination of formula of a physical quantity such as time period of simple pendulum and determination of formula for centripetal force by the method of units and dimensions
- (c) Knowing the correctness of a physical equation

Limitations of dimensional analysis

### **UNIT II**

#### **Force and Motion**

Scalar and vector quantities–definitions with examples. Simple addition and multiplication of scalar and vector quantities

Force - resolution and composition of forces, Parallelogram Law of forces with the derivation for the resultant force and direction of the resultant force.

Newton's Laws of motion – concept of momentum and their application, determination of force equation from Newton's second law of motion, derivation of Newton's third law of motion from 2<sup>nd</sup> Law, impulse and impulsive forces, simple numerical problems.

Projectile motion - horizontal and oblique and their equation.

Derivation and definitions of Time of flight, Maximum height, Horizontal range and the condition for the maximum range.

Linear and angular velocity and acceleration with their relations.

Circular motion – centripetal force and centrifugal force in detail.

Banking of roads and rails, bending of a cyclist.

### 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, Kinetic energy and Potential energy with examples and their derivation. Principle of conservation of energy (for freely falling bodies), transformation of energy from one form to another.

### UNIT IV

#### Simple Harmonic Motion and Rotational Motion

Definition of simple harmonic motion relation for the displacement, velocity, acceleration, and time period of a body executing simple harmonic motion, Free, forced and resonant vibrations with examples

Definitions of torque and angular momentum, radius of gyration

Derivation of rotational kinetic energy and hence definition of moment of inertia

Conservation of angular momentum and applications

### UNIT V

#### Temperature and Transfer of Heat

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

Modes of transfer of heat (conduction, convection and radiation with examples), Coefficient of thermal conductivity. Determination of coefficient of thermal conductivity of good conductor by Searle's method and bad conductor by Lee's disc method, Properties of heat radiation. Black body radiation-Stefan's law, Kirchhoff's law, Wien's law, in case of black body radiations. Prevost's theory of heat exchange

### REFERENCES

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

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 80 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

## SEMESTER I

Course Title: Applied Chemistry-I

Course Code: CE/EE/ME-104

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### **Objective**

*Every branch of engineering is expanding greatly. The contributions of chemicals and chemical products are playing important role in the field of engineering, biotechnology, agriculture and pharmacology etc. The numbers of such chemical products are exponentially increasing each successive year. This results in enhancing the responsibility of engineers while choosing engineering materials for converting them into finished products. Now a days, choosing engineering material is not only based on conventional qualitative and quantitative testing of their chemical composition and behavior under service conditions, but also based on environmental and eco-friendly factors. To achieve such objectives it is essential to know applied aspects of chemistry. Applied chemistry for diploma students in various engineering and technology courses is designed to develop scientific temper and appreciation of physical and chemical properties of engineering materials, which are used in their professional career. Best efforts should be made to teach and train the engineers by imparting essential knowledge required from this subject through demonstrations, and minor projects.*

*Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.*

## **UNIT 1**

### **Basics Concepts**

Definition of matter, element, compound and mixtures, atom, molecule, ion, 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.

Matter, element, compound and mixtures, atoms, molecules, ions, symbols and formulae, Atomic mass (A), atomic number (Z) isotopes, isobars, isotone.

Scope and significance of Environmental Science.

Decomposition of organic compounds and biodegradability.

## **UNIT 1I**

### **Atomic Structure and Chemical Bonding**

Fundamental particles i.e. electron, proton and neutron (their characteristics). Modern periodic law, introduction of periodic table, periods and groups. 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 of 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) Molality as applied in relation to a solution. 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. Different industrial applications of 'Electrolysis'. Elementary study of (i) lead acid battery and (ii) Ni-Cd battery with special reference to their reaction mechanisms.

## REFERENCES

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



**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

## SEMESTER-I

Course Title: Engineering Drawing-I

Course Code: CE/EE/ME/ECE-105

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### Objective

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. The emphasis while imparting instructions should be to develop conceptual skills in the students.

- Note:
1. First angle projection is to be followed
  2. Instruction relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

### Unit-I

#### **Drawing Office Practice, Lines, Lettering and Dimensioning**

Drawing instruments, Sizes and layout of standard drawing sheets, Sizes of drawing boards, Drafting table/board.

Different types of lines in engineering drawing as per BIS specifications, Instrumental single stroke (vertical and inclined gothic) lettering of 35 mm height in the ratios of 7:4, Instrumental double stroke lettering of 35 mm height in the ratio of 7:4, vertical. Free hand lettering (alphabet and numerals) lower case and upper case, single stroke vertical and inclined at 75 degree in different standard series of 2.5, 3, 5, 7, 10, and 15 mm heights in the ratio of 7:4. Necessity of dimensioning - methods and principles. Dimensioning of overall sizes, circles, thread holes, chamfered surfaces, angles, tapered surface holes equally spaced on PCD, counter sunk hole counter bored holes, cylindrical parts, narrow space and gaps, radii, curves and arches – chain and parallel dimensioning

### Unit-II

#### **Simple Geometrical Constructions & Scale**

Construction of regular polygons (triangle, square, pentagon, hexagon) and circles, Ellipses (concentric circle method and oblong method), Parabola (rectangle and tangent method). Curves (cycloid and helix).

Scales – their need and importance, Definition of representative fraction (RF); Finding RF of a given scale, Types of scales, Construction of plain and diagonal scales.

## **Unit-III**

### **Principle of Projections**

Principle of orthographic projection, Planes of projection, four quadrants, first angle projection and third angle projection, Projection of points situated in different quadrants. Projection of lines, Lines inclined to one plane and parallel to the other and vice versa. Projection of Planes: Planes perpendicular and parallel to either of the planes; planes perpendicular to one plane and parallel to the other or vice versa. Projection of solids, such as Prism, Cube, Cylinder and Cones with axis perpendicular to horizontal plane or parallel to horizontal plane/vertical plane or both. Drawing 3 orthographic views of given objects (at least five objects). Identification of surfaces on drawn orthographic views from isometric object drawn. Exercises on missing lines, surfaces and views.

## **Unit-IV**

### **Sectional Views & Isometric Views**

Need for sectional views – conventional sections of various materials. Drawing of different conventions for materials in sections, conventional breaks for shafts, pipes, rectangular, square, angle, channel and rolled sections.

Fundamentals of isometric projections (theoretical instructions) and isometric scales. Isometric views from 2 or 3 given orthographic views

## **Unit-V**

### **Development of Surfaces (2 sheets):**

Development of surfaces – cubes, prisms, (square, pentagonal and hexagonal), cylinders, pyramids (square, pentagonal, hexagonal) and cones

## ***RECOMMENDED 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
3. Engineering Drawing by PS Gill published by SK Kataria and sons, Delhi
4. Engineering Drawing by RB Gupta published by Satya Prakashan, New Delhi

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each

unit.

## SEMESTER I

Course Title: English & Communication Skills-I Lab

Course Code: CE/EE/ME/ECE-111

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

Duration of Exam: 3 Hrs

### LIST OF PRACTICALS

1. Locating a Book in Library
2. How to look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics.
3. How to Seek Information from an Encyclopedia
4. Listening pre-recorded English language learning programme
5. Paper Reading before an audience (reading unseen passages)
6. Study of spelling Rules
7. Study of essentials of a Good Speech to respond and comprehend visual, oral themes, situations or stimulus and practice before select gathering
8. Exercises on use of different abbreviations
9. Greetings for different occasions
10. Introducing oneself, others and leave taking
11. Exercises on writing sentences on a topic

## SEMESTER I

Course Title: Applied Physics-I Lab

Course Code: CE/EE/ME/ECE-112

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### LIST OF PRACTICALS

1. To find the radius and diameter of given wire by screw gauge
2. To find the volume of cylinder (hollow and solid) by vernier caliper
3. To find the thickness of glass strip by spherometer
4. To verify parallelogram law of forces
5. To find the time period of a simple pendulum and determine the length of second's pendulum.
6. To find the frequency of a tuning fork by a sonometer
7. To find the velocity of sound by using resonance apparatus at room temperature.
8. To find the Moment of Inertia of a flywheel about its axis of rotation
9. To find the surface tension of a liquid by capillary rise method
10. To determine the atmospheric pressure at a place using Fortin's Barometer

## SEMESTER I

Course Title: Applied Chemistry-I Lab

Course Code: CE/ERE/ME-113

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### 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 solution of HCl with the help of a solution of NaOH and an intermediate solution of standard oxalic acid
4. Find the amount of chlorides in mg per liter in a sample of H<sub>2</sub>O with the help of a solution of AgNO<sub>3</sub>
5. Determine the degree of temporary hardness of water by Soap Titration method
6. Determine the percentage purity of commercial sample like blue vitriol 12.5 g. of which have been dissolved per litre. Given M/20 Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>.
7. Estimation of amount of iron in hematite ore volumetrically
8. Estimation of total alkalinity of water volumetrically
9. Determine conductance, pH of water sample using conductance bridge and pH meter
10. Determination of solubility of a solid at room temperature

## SEMESTER I

Course Title: Engineering Drawing-I

Course Code: CE/EE/ME/ECE-114

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### LIST OF PRACTICALS

1. Drawing Office Practice, Lines, Lettering and Dimensioning (4 sheets)
2. Simple Geometrical Constructions & Scale (4 sheets)
3. Principle of Projections (6 sheets)
4. Sectional Views & Isometric Views (3 sheet)
5. Development of Surfaces (2 sheets):

## SEMESTER I

Course Title: General Workshop Practice-I

Course Code: CE/EE/ME/ECE-115

L	T	P
0	0	6

Max. Marks: 150

External: 75

Internal Assessment: 75

### Objective

*In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hand on experience about use of different tools and basic manufacturing practices. This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives*

### LIST OF PRACTICALS

#### 1. Carpentry & Painting Shop-I:

Introduction to various types of wood by demonstration and their identification.  
Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.

Job I Marking, Sawing and planning practice

Job II Extensive planning practice

Job III Chiseling practice

Introduction to joints, their relative advantages and uses.

Job IV Preparation of half lap joint

Job V Preparation of Mortise and Tenon Joint

Importance and need of polishing wooden items, Introduction to polishing materials.

Job VI Preparation of surface before polishing.

Job VII Application of primer coat.

Job VIII Polishing on wooden items.

#### 2. Fitting and Plumbing Shop-I

Introduction to fitting shop, Common materials used in fitting shop, Identification of materials. Description and demonstration of various types of work benches. Holding devices and files, Precautions while filing.

Job I Filing practice (Production of flat surfaces) Checking by straight edge.

Job II Marking of jobs, use of marking and measuring tools.

Job III Filing a dimensioned rectangular or Square piece of an accuracy of +0.25mm.

Introduction to chipping, Demonstration on chipping and its applications.  
Demonstration and function of chipping tools.

Job IV Chipping practice

Description & demonstration of simple operation of hacksawing, demonstration and description of various types of blades, their uses and method of fitting the blade.

Job V Making a cutout from a square piece of iron block using hacksaw.

**3. Welding Shop-I**

Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded.

Electric arc welding, (AC and DC) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc.

Job I Practice of striking arc while using electric arc welding set.

Job II Welding practice job on arc welding for making uniform and straight weld beads.

Common welding defects and inspection. Various types of joints and end preparation.

Job III Preparation of butt joint arc welding.

Job IV Preparation of lap joint by arc welding.

Job V Preparation of single V/double V butt joint by using electric arc welding.

Job VI Preparation of Tee joint by arc welding.

**4. Forging shop**

Introduction to forging, forging tools, tongs, blowers/pressure blowers, hammers, chisels, punch, anvil, swag-block etc. Forging operations.

Job I Forge a L hook or Ring from MS rod 6 mm  $\phi$

Job II Forge a chisel and give an idea of hardening and tempering

Job III Lap joint with forge welding

Job IV High Strength Steel (HSS) tools – forging of Lathe shaper tools like side-tools and V-shape tools

**5. Electric & Electronic Shop-I**

Study and demonstration of common electrical materials such as wires, cables, switches, fuses, ceiling roses, battens, cleats and allied items, tools and accessories such as multi-meter, CRO, types of resistors (colour code) and potentiometers.

Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin plugs.

Job II Laying out of complete wiring of a house (i) batten wiring (ii) plastic casing and capping.

Job III Testing and rectification of simulated faults in household appliances such as iron, kettles, water-heaters, fans and mixers.

Job IV Battery connections in series and parallel and battery testing with the help of hydrometers and cell testers.

Job V Cut, strip, join and insulate wires & cables.

Job VI Unsoldering and soldering of resistor, capacitor, diodes, transistors on a PCB.

Job VII joining, mounting and dismantling of plugs, sockets, connectors, Bana plugs and terminal strips.

Job VI De-solder and clean all the components and wires from a given equipment, a PCB or a tag strip including sleeving and use of identified tags.



### Reference Books

1. Manual on Workshop Practice by K Venkata Reddy, KL Narayana and P Kaunaioh; MacMillan India Ltd., New Delhi
2. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi

❖ **Note:** *The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.*

## SEMESTER-I

Course Title: Student Centred Activities

Max. Marks: 50

Course Code: EE-116

Internal Assessment: 50

L T P

0 0 4

SCA will comprise of co-curricular activities like extension lectures, library studies, games, hobby clubs e.g. photography, painting, singing, seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, Civil Defence/ Disaster Management activities etc.

# II SEMESTER

## SEMESTER II

Course Title: English and Communication Skills-II

Course Code: CE/EE/ME/ECE - 201

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### **Objective**

Language is the most commonly used 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 skills to communicate effectively to handle the future jobs in industry. The objective of this course is to enable 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 skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.

### **UNIT 1**

#### **Facets of Literature-I (Short Stories & Poems)**

Short Stories:

1. The Portrait of a Lady - Khushwant Singh
2. The Doll's House – Katherine Mansfield
3. The Refugees – Pearl S. Buck

Poems:

1. All The World's A Stage – W. Shakespeare
2. Say Not, The Struggle Nought Availeth – A.H. Clough
3. Pipa's Song – Robert Browning

### **UNIT 1I**

#### **Facets of Literature-II (Prose)**

1. Walking Tours – R.L. Stevenson
2. A Dialogue on Civilization – C.E.M. Joad
3. The Sign of Red Cross – Horace Shipp

### **UNIT III**

#### **Grammar and Usage**

Narration

Voice

Idioms and Phrases

### UNIT IV

#### Correspondence & Drafting

Correspondence:

Business Letters & Personal letters

Drafting:

Report Writing, Inspection Notes, Memos, Circulars and Notes, Telegrams, Press Release,

Agenda and Minutes of Meetings, Applying for a Job

### UNIT V

#### Communication

Media and Modes of Communication, Channels of Communication, Barriers to Communication, Listening Skills, Body language, Humour in Communication,

### REFERENCES

1. English and Communication Skills, Book-II By Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Singla, Prescribed by NITTTR, Chandigarh & Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
2. Essentials of Business Communication by Pal and Rorualling; Sultan Chand and Sons
3. The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India
4. New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
5. 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,
6. A Practical English Grammar by Thomson and Marlinet
7. Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill
8. English Conversation Practice by Grount Taylor; Tata McGraw Hill
9. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
10. Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi
11. Communication Skills by Ms R Datta Roy and KK Dhir; Vishal Publication, Jalandhar

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

## SEMESTER II

Course Title: Applied Mathematics-II

Course Code: CE/EE/ME/ECE - 202

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### **Objective**

Applied mathematics forms the backbone of engineering students. Basic elements of Differential calculus and integral calculus and statistics have been included in this course. This will develop analytical abilities to apply in engineering field and will provide continuing educational base to the students.

### **UNIT 1**

#### **Differential Calculus-I**

Definition of function; Concept of limits.

Four standard limits  $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$ ,  $\lim_{x \rightarrow 0} \frac{\sin x}{x}$

$$\lim_{x \rightarrow 0} \frac{a^x - 1}{x}, \lim_{x \rightarrow 0} (1 + x)^{\frac{1}{x}}$$

Differentiation by definition of  $x^n$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ,  $e^x$ ,  $\log_a x$  only.

Differentiation of sum, product and quotient of functions. Differentiation of function of a function.

### **UNIT 1I**

#### **Differential Calculus-II**

Differentiation of trigonometric inverse functions. Logarithmic differentiation.

Exponential differentiation Successive differentiation (excluding nth order).

Applications:

- (a) Maxima and minima
- (b) Equation of tangent and normal to a curve (for explicit functions only).

### **UNIT III**

#### **Integral Calculus-I**

Integration as inverse operation of differentiation.

Simple integration by substitution, by parts & by partial fractions (for linear factors only)

### **UNIT IV**

#### **Integral Calculus-II**

Evaluation of definite integrals (simple problems).

$$\text{i) } \int_0^{\frac{\pi}{2}} \sin^n x dx \quad \text{ii) } \int_0^{\frac{\pi}{2}} \cos^n x dx \quad \text{iii) } \int_0^{\frac{\pi}{2}} \sin^m x \cos^n x dx$$

using formulae without proof (m and n being positive integers only)

Applications:

- (a) Area bounded by simple curves and axes.
- (b) Volume of a solid formed by revolution of an area about axes (simple problems).

## UNIT V

### Statistics

Measures of Central Tendency: Mean, Median, Mode.

Measures of Dispersion: Mean deviation, Standard deviation.

### RECOMMENDED BOOKS

1. **Grewal BS**, Elementary Engineering Mathematics by Khanna Publishers, New Delhi.
2. **Kohli S**, Engineering Mathematics by Vol. I & II by IPH, Jalandhar
3. **Dr. Sharma RD** Applied Mathematics
4. **Sabharwal SS & Jain Sunita** Applied Mathematics, Vol. I & II by, Eagle Parkashan, Jalandhar
5. **Gupta Dass** Engineering Mathematics.
6. **Chawla C Dass**, Engineering Mathematics by Asian Publishers, New Delhi

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

## SEMESTER II

Course Title: Applied Physics-II

Course Code: CE/EE/ME/ECE - 203

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### **Objective**

*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*

### **UNIT 1**

#### **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.

Acoustics of buildings–reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time

Ultrasonics–production (magnetostriction and piezoelectric detection) & their engineering applications

### **UNIT 1I**

#### **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 and its SI units. Gauss's Law. Electric field intensity and electric potential, equipotential surfaces and their properties. Calculation of 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. Kirchoff's law and its applications, Wheatstone bridge principle. Heating effect of current and concept of electric power.

## UNIT V

### Modern Physics

Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, helium – neon and ruby lasers, applications of lasers.

Fibre optics: Introduction, optical fiber materials, types, light propagation & applications.

Superconductivity: Phenomenon of super conductivity.

Energy sources-Conventional and non-conventional (wind, water, solar, bio, nuclear energy) (only elementary idea).

## RECOMMENDED 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

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

## SEMESTER II

Course Title: Applied Chemistry-II

Course Code: CE/EE/ME - 204

L T P

4 0 0

Max. Marks: 100

External: 80

Internal Assessment: 20

Duration of Exam: 3 Hrs

### **Objective**

The role of chemistry in every branch of engineering and technology is expanding greatly. Now a days, various chemical products 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 and appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstrations/ minor projects and with the active involvement of students.

Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

### **UNIT I**

#### **Manufacture of Materials**

A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), roasting, calcination and refining as applied in relation to various metallurgical operations.

Metallurgy of (i) Aluminium (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.

Manufacture of Portland cement.

Manufacture of ordinary glass and lead glass and their applications.

Definitions and types of polymers and plastics.

### **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 solid 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. 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
3. Heat treatment (Quenching, annealing, tempering and normalizing)

## UNIT IV

### Lubricants

Definition of (i) lubricant (ii) lubrication. Classification of lubricants.

Principles of lubrication:- (i) fluid film lubrication (ii) boundary lubrication (iii) extreme pressure lubrication.

Characteristics of a lubricant such as viscosity, viscosity index, volatility, oiliness, acidity, emulsification, flash point and fire point and pour point.

## UNIT V

### 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.

## 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

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

## SEMESTER II

Course Title: Engineering Drawing-II

Course Code: CE/ME - 205

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### Objective

*Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.*

### UNIT-I

#### Assembly Drawing & Threads

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.

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, Nuts & Bolts

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

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

### UNIT-III

#### Screws, Studs, Keys and Cotters

Drawing various types of machine screws. Drawing various types of studs and set screws.

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) gib and cotter joint (ii) knuckle joint

### UNIT-IV

#### Rivets and Welded Joints

Types of structural and general purposes 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.

Various conventions and symbols of welded joints (IS 696). Practical applications of welded joints say joints on steel frames, windows, doors and furniture

### UNIT-V

#### **Couplings, Symbols & Conventions (4 sheets)**

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

Civil engineering sanitary fitting symbols. Electrical fitting symbols for domestic interior installations. Building plan drawing with electrical and civil engineering symbols.

### RECOMMENDED 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
3. Engineering Drawing by PS Gill; published by SK kataria and Sons, New Delhi
4. Machine Drawing by RB Gupta published by Satya Prakashan, New Delhi.

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

## SEMESTER II

Course Title: English & Communication Skills-II Lab  
Course Code: CE/EE/ME/ECE - 211

L T P  
0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

Duration of Exam: 3 Hrs

### LIST OF PRACTICALS

1. Practice on browsing information from Internet.
2. Group Discussions
3. Mock Interviews
4. Telephone Etiquette – demonstration and practice
5. Situational Conversation with feedback through video recording
6. Presentation on a given theme (using PowerPoint)
7. Exercises leading to personality development like mannerism, etiquettes, body language etc.
8. Reading unseen passages
9. Writing (developing) a paragraph
10. Exercises on writing notices and telephonic messages

## SEMESTER II

Course Title: Applied Physics-II Lab

Course Code: CE/EE/ME/ECE - 212

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### LIST OF PRACTICALS

1. To verify Ohm's law
2. To verify law of resistances in series and in parallel
3. To find the internal resistance of a cell by potentiometer
4. To convert a galvanometer into an ammeter of given range
5. To convert a galvanometer into voltmeter of given range
6. To find the velocity of sound in air by resonance apparatus
7. To find the frequency of a tuning fork by a sonometer
8. To set a model of an astronomical telescope and find its magnifying power
9. To set up a model of a compound microscope

## SEMESTER II

Course Title: Applied Chemistry-II Lab

Course Code: CE/EE/ME - 213

L T P

0 0 1

Max. Marks: 50

External: 25

Internal Assessment: 25

### 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 non-volatile 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. To determination the amount of copper in the given sample of copper sulphate with the help of M/20 sodium thiosulphate solution.
10. Detection of metal ion in the rust (solution of rust in concentrated HCL may be given



## SEMESTER II

Course Title: Applied Chemistry-II Lab  
Course Code: CE/EE/ME - 214  
L T P  
0 0 4

Max. Marks: 100  
External: 50  
Internal Assessment: 50

### **LIST OF PRACTICALS**

1. Given a PC, name its various components and list their functions
2. Identification of various parts of a computer and peripherals
3. Practice in installing a computer system by giving connection
4. DOS Commands (internal / external) e.g. TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP
5. Exercises on entering text and data (Typing Practice using any tutor)
6. Features of Windows as an operating system
  - Start
  - Shutdown and restore
  - Creating and operating on the icons
  - Opening closing and sizing the windows
  - Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
  - Creating and operating on a folder
  - Changing setting like, date, time color (back ground and fore ground)
  - Using short cuts
  - Using on line help
7. **MS-Word**
  - File Management:  
Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file
  - Page Set up:  
Setting margins, tab setting, ruler, indenting
  - Editing a document:  
Entering text, Cut, copy, paste using tool- bars
  - Formatting a document:  
Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
  - Aligning of text in a document, justification of document, Inserting bullets and numbering
  - Formatting paragraph, inserting page breaks and column breaks, line spacing
  - Use of headers, footers: Inserting footnote, end note, use of comments
  - Inserting date, time, special symbols, importing graphic images,

- drawing tools
- Tables and Borders:  
Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
- Print preview, zoom, page set up, printing options
- Using Find, Replace options
- Using Tools like:  
Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelopes and labels
- Using shapes and drawing toolbar,
- Working with more than one window in MS Word,
- How to change the version of the document from one window OS to another
- Conversion between different text editors, software and MS word

### 8. MS-Excel

- Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets
- Menu commands:  
Create, format charts, organize, manage data, solving problem by analyzing data, and exchange with other applications. Programming with MS-Excel, getting information while working
- Work books:  
Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations, working with arrays
- Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet
- Creating a chart:  
Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
- Using a list to organize data, sorting and filtering data in list

### 9. MS PowerPoint

- a) Introduction to PowerPoint
  - How to start PowerPoint
  - Working environment: concept of toolbars, slide layout, templates etc.
  - Opening a new/existing presentation
  - Different views for viewing slides in a presentation: normal, slide-sorter etc.

- b) Addition, deletion and saving of slides
  - e) How to view the slide show?
    - Viewing the presentation using slide navigator
    - Slide transition
    - Animation effects etc.
10. Internet and its Applications
- a) Log-in to internet
  - b) Navigation for information seeking on internet
  - c) Browsing and down loading of information from internet
  - d) Sending and receiving e-mail
    - Creating a message
    - Creating an address book
    - Attaching a file with e-mail message
    - Receiving a message
    - Deleting a message

### RECOMMENDED BOOKS

1. Fundamentals of Computer by V . Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi.
2. Computers Today by SK Basandara, Galgotia Publication Pvt Ltd. Daryaganj, New Delhi.
3. MS-Office 2000 for Everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., New Delhi
4. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
5. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. Mastering Windows 95, BPB Publication, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. On Your Marks - Net...Set...Go... Surviving in an e-world by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Learning MS Office XP by Ramesh Bangia, Khanna Book Publishing Co. (P)

## SEMESTER II

Course Title: Engineering Drawing-II

Course Code: CE/ERE/ME - 215

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### LIST OF PRACTICALS

1. Assembly Drawing & Threads (4 sheets)
2. Locking Devices, Nuts & Bolts (4 sheet)
3. Screws, Studs, Keys and Cotters (3 sheet)
4. Rivets and Welded Joints (3 sheets)
5. Couplings, Symbols & Conventions (4 sheets)

### RECOMMENDED 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
3. Engineering Drawing by PS Gill; published by SK kataria and Sons, New Delhi
4. Machine Drawing by RB Gupta published by Satya Prakashan, New Delhi.

## SEMESTER II

Course Title: General Workshop Practice-II

Course Code: CE/EE/ME/ECE - 216

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### **Objective**

*As we know that, the psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met.*

### **LIST OF PRACTICALS**

#### **1. Carpentry and Painting Shop-II**

Introduction to joints, their relative advantages and uses.

Job I Preparation of Dovetail joint and glued joint.

Job II Preparation of Mitre Joint

Job III Preparation of a lengthening Joint

Job IV Preparation of at least one utility job with and without lamination.

Demonstration of job showing use of Rip Saw, Bow saw and Tramme, method of sharpening various saws.

Demonstration of job on Band Saw and circular saw, chain and diesel universal wood working machine, saw resharpening machine, Saw Brazing unit.

Demonstration of various methods of painting wooden items.

Job V Preparation of surface before painting.

Job VI Application of primer coat

Job VII Painting wooden items by brush/roller/spray

#### **2. Fitting and Plumbing Shop-II**

Description and demonstration of various types of drills, taps and dies

Selection of dies for tapping. Types of taps, tapping, dieing and drilling operations.

Job I Making internal and external threads on a job by tapping and dieing operations (manually)

Precautions while drilling soft metals, specially aluminum and lead.

Job II Drilling practice on soft metals (Aluminum, Brass and lead)

Care and maintenance of measuring tools like calipers, steel rule, try square, vernier, micrometer, height gauge, combination set, reading gauge. Handling of measuring instruments, checking of zero error, finding of least count.

Job III Preparation of a job by filing on non-ferrous metal.

Job IV Production of a utility job involving all the above operations.

Job V Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow T - Union, socket, stopcock, taps, etc

Description and demonstration of various types of drills, taps and dies; Selection of dies for tapping; Types of taps, Tapping and dieing operations.

### 3. Welding Shop-II

Introduction of the gas welding, gas welding equipment, adjustments of different types of flames, demonstration and precautions about handling welding equipment.

Job I Practice in handling gas welding equipment and welding practice.

Common welding joints generally made by gas welding.

Job II Preparation Butt joint by gas welding.

Job III Preparation of small cot conduit pipe frame by electric arc welding/gas welding.

Job IV Preparation of square pyramid from M.S rods by welding (type of welding to be decided by students themselves).

Job V Exercise job on spot/seam welding machine.

Demonstration of various methods adopted for painting steel items.

Job VI Painting steel items by brush/roller/ spray

### 4. Sheet metal & Machine shop

Introduction to sheet metal process and tools

Job I Making sheet metal joints

Job II Making sheet metal tray or a funnel or a computer chassis

Job III Preparation of sheet metal jobs involving rolling, shearing, creasing, bending and cornering

Job IV Prepare a lap riveting joint of sheet metal pieces

Introduction to various machines used in machine shop.

Job V Exercise on simple turning

Job VI Exercise on taper turning

Job VII Marking and drilling practice on mild steel piece

Job VIII Marking and drilling practice on aluminium piece

Job IX Demonstration of various functions of CNC Machine

### 5. Electric Shop-II

Importance of three phase wiring and its effectiveness.

Job I Laying out 3 phase wiring for an electric motor or any other 3 phase machine.

Estimating and costing power consumption.

Job II Connecting single phase energy meter and testing it. Reading and working out the power consumption and the cost of energy.

Job III Checking continuity of connection (with tester and bulbs), location of faults with a multimeter and their rectification in simple machines and/or other electric circuits fitted with earthing.

Demonstration of dismantling, servicing and reassembling of a table fan/ceiling fan/air cooler/mixer/electric iron, Electric heater, geaser, electric oven etc.

Job IV Dismantling, serving and reassembling of any of the above electrical appliances.

Job V Demonstration of testing single phase/three phase electrical motor by using voltmeters ammeter clip on meter technometer etc.

Job VI Reversing the rotation of motor.

### RECOMMEND BOOKS

1. Manual on Workshop Practice by K Venkata Reddy, KL Narayana and P Kaunaioh; MacMillan India Ltd., New Delhi
2. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi

### Note:

The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

## SEMESTER-II

Course Title: Student Centred Activities

Max. Marks: 50

Course Code: EE-117

Internal Assessment: 50

L T P

0 0 4

SCA will comprise of co-curricular activities like extension lectures, library studies, games, hobby clubs e.g. photography, painting, singing, seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, Civil Defence/ Disaster Management activities etc.



# III SEMESTER

## SEMESTER-III

Course Title: Fundamentals of Electrical Engineering

Course Code: DEE- 301

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### **Objective**

*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 acquaintance with various terms knowledge of fundamental concepts of electricity, magnetism and various principles related to it.*

### **UNIT-1**

#### **Overview & Theorems of DC Circuits**

Ohm's Law, Concept of voltage, current, power and energy. Simple problems on series and parallel combination of resistors with their wattage consideration. Application of Kirchhoff's current law and Kirchhoff's voltage law to simple circuits. Conversion of circuits from Star to Delta and Delta to Star. Constant Voltage and Constant Current Sources:

(a) Concept of constant voltage source, symbol and graphical representation characteristics of ideal and practical sources.

(b) Concept of constant current sources, symbol, characteristics and graphical representation of ideal and practical current sources.

Thevenin's theorem, Norton's theorem, application of network theorem in solving D.C circuit problems.

### **UNIT-II**

#### **Electro Magnetic Induction**

Concept of magnetic field produced by flow of current, Magnetic circuit, concept of magnetomotive force (MMF), flux, reluctance, permeability, analogy between electric and magnetic circuit.

Faraday's law and rules of electro-magnetic induction, principles of self and mutual induction, self and mutually induced e.m.f, simple numerical problems.

Concept of current growth, decay and time constant in an inductive (RL) circuit.

Energy stored in an inductor, series and parallel combination of inductors.

### **UNIT-III**

#### **AC Fundamentals**

Concept of alternating voltage and current, Difference between a.c and d.c

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

Representation of sinusoidal quantities by phasor diagrams. Equation of sinusoidal wave form (with derivation).

Effect of alternating voltage applied to a pure resistance, pure inductance and pure capacitance.

## UNIT-IV

### AC Circuits

Inductive reactance and capacitive reactance. Alternating voltage applied to resistance and inductance in series. Alternating voltage applied to resistance and capacitance in series. Impedance triangle and phase angle. Solutions and phasor diagrams for simple RLC circuits (series and parallel). Introduction to series and parallel resonance and its conditions.

Power in pure resistance, inductance and capacitance, power in combined RLC circuits. Power factor, active and reactive power and their significance, importance of power factor. J-notation and its application in solving a series and parallel a.c circuits. Definition of conductance, susceptance and admittance.

## UNIT-V

### Batteries & Types of Power Plants

Basic idea about primary and secondary cells. Construction, working and applications of Lead-Acid, Nickel-Cadmium and Silver-Oxide batteries. Charging methods used for lead-acid battery (accumulator). Care and maintenance of lead-acid battery. Series and parallel connections of batteries. General idea of solar cells, solar panels and their applications).

Brief explanation of principle of power generation in thermal, hydro and nuclear power stations and their comparative study. A Visit to a nearby Power Station(s) may be organized for better understanding and exposure. Elementary block diagram of above mentioned power stations

## RECOMMENDED BOOKS

1. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Sons, New Delhi
2. Experiments in Basic Electrical Engineering by SK Bhattacharya, KM Rastogi; New Age International (P) Ltd.; Publishers New Delhi
3. Electrical Science by Choudhury S.; Narosa Publishing House Pvt Ltd, Darya ganj, New Delhi
4. Basic Electrical and Electronics Engineering by Kumar KM, Vikas Publishing House Pvt Ltd, Jang pura, New Delhi
5. Basic Electrical Science and Technology by Kumar KM, Vikas Publishing House Pvt Ltd, Jang pura, New Delhi
6. Electrical Technology by BL Theraja, S Chand and Co, New Delhi
7. Basic Electricity by BR Sharma; Satya Prakashan; New Delhi
8. Principles of Electrical Engineering by BR Gupta, S Chand and Co, New Delhi
9. Basic Electrical Engineering by PS Dhogal, Tata Mc Graw Hill, New Delhi
10. Basic Electrical Engineering by JB Gupta; SK Kataria and Sons, New Delhi

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 80 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit.

## SEMESTER III

Course Title: Electronics-I

Course Code: DEE- 302

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### **Objective**

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

*In this course, topics like semi-conductor theory, semi-conductor Diodes, Bipolar transistors, rectifiers, single stage and multistage amplifiers and field effect transistors have been included.*

### **UNIT- I**

#### **Introduction**

Brief history of development of electronics. Active and passive components. Concept of current and voltage sources, constant voltage and constant current sources, their graphical representation. Conversion of voltage source into current source and vice-versa. Difference between actual voltage source and constant voltage source

### **UNIT- II**

#### **Semi-Conductor Theory**

Atomic structure, crystalline structure. Energy band theory of crystals, energy band structure of insulator, semiconductor and conductor, generation and recombination of electron hole pairs. 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 -III**

#### **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 in 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 ( $\pi$ ) 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-IV

### 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. Different biasing circuits, limitations, simple problems to calculate operating point in different biasing circuits. Use of Thevenin's theorem to determine operating point. Effect of temperature on the operating point of a transistor. Concept of h-parameters of a transistor

## UNIT-V

### 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, current gain, power gain, frequency response, decibel gain and band width. 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.

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.

## RECOMMENDED BOOKS

1. Basic Electronics and Linear Circuits by NN Bhargava, Tata McGraw Hill, New Delhi
2. Analog Electronics by DR Arora, Ishan Publications, Ambala City.
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 Publishing House Pvt. Ltd., New Delhi
8. Principles of Electronics by SK Bhattacharya and Renu Vig, SK Kataria and Sons, Delhi
9. Basic Electronics by JB Gupta, SK Kataria and Sons, New Delhi
10. V.K. Mehta, "Basic electronics", S.Chand and Co, New Delhi

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER III

Course Title: Electrical and Electronics Engineering Material Max. Marks: 100

Course Code: ERE - 303

External: 60

L T P

Internal Assessment: 40

4 0 0

Duration of Exam: 3Hrs

### **Objective**

*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.*

### **UNIT- I**

#### **Classification**

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

Special Materials: Thermocouple, bimetals, lead soldering and fuse material, mention their applications

Introduction of various engineering materials necessary for fabrication of electrical machines such as motors, generators, transformers etc

### **UNIT-II**

#### **Conducting Materials**

Introduction, Resistance and factors affecting it such as alloying and temperature etc. 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, Solderability contact resistance. Application in the field of electrical engineering.

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

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

### **UNIT-III**

#### **Review of Semi-conducting Materials**

Semi-conductors and their properties, Materials used for electronic components like resistors, capacitors, diodes, transistors and inductors etc.

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), polyethylene, polyester, 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, SF<sub>6</sub> 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.

#### **RECOMMENDED 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. Electrical Engineering Materials by PL Kapoor, Khanna Publishers, New Delhi
6. Electrical and Electronics Engineering Materials BR Sharma and Others, Satya Parkashan, New Delhi

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-IV

Course Title: Computer Programming and Applications

Course Code: EE- 304

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### **Objective**

*Computer plays a very vital role in present day life, more so, in the professional life of Diploma engineers. In order to enable the students use the computers effectively in problem solving, this course offers the modern programming language C along with exposure to various engineering applications of computers. The knowledge of C language will be reinforced by the practical exercises and demonstration of application software in the field of Electrical Engineering during the course of study. Introduction to data base management system is also a very significant field with vast employment potential.*

### **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,

### **UNIT- III**

#### **Operators and Statements**

Operators and Expressions, Managing Input-Output operations like reading a character, writing a character, formatted input, formatted output through print, scan, getch, putt statements etc. Decision making and branching using IF..... Else, switch, go to statements

### **UNIT- IV**

#### **Arrays and Functions**

Decision making and looping using do-while, and for statements, Arrays - one dimensional and two dimensional, Functions, Concept of pointers, structures and Files.

### **UNIT- V**

#### **Applications**

Computers application overview, Demonstration of various applications software related to branch such as:

MATLAB, PSIM, MULTISIM, PSPICE in Electrical Engineering



### RECOMMENDED BOOKS

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

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-III

Course Title: Fundamentals of Electrical Engineering Lab

Course Code: EE-311

L T P

0 0 2

Max. Marks: 50

University Examination: 25

Internal Assessment: 25

### LIST OF PRACTICALS

1. Familiarization of measuring instruments viz voltmeter, ammeter, CRO, Wattmeter and multi-meter and other accessories
2. Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions.
3. To measure (very low) resistance of an ammeter and (very high) resistance of a voltmeter
4. To verify in d.c circuits:
  - a.. Thevenin's theorem,
  - b. Norton's theorem,
5. To observe change in resistance of a bulb in hot and cold conditions, using voltmeter and ammeter.
6. Verification of Kirchhoff's Current Law and Kirchhoff's Voltage Laws in a dc circuit
7. To find the ratio of inductance of a coil having air-core and iron-core respectively & to observe the effect of introduction of a magnetic core on coil inductance
8. To find the voltage current relationship in a single phase R-L and R-C Series circuits, draw their impedance triangles and determination of the power factor in each case.
9. To test a lead - acid storage battery and to charge it.
10. Measurement of power and power factor in a single phase R.L.C. circuit and to calculate active and reactive power.
11. Visit to nearby Power Station(s).

### INSTRUCTIONAL STRATEGY

*Basic electrical engineering being a fundamental subject need to be handled very carefully and in a manner such that students develop clear understanding of principles and concepts and develop skill in their application in solving related problems. Teacher may lay emphasis on laboratory experiments and give lot of tutorial work to students in order to give them an opportunity in mastering the basics in solving related problems*

## SEMESTER-III

Course Title: Electronics-I Lab

Course Code: EE-312

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### 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) (ii) series inductor (iii)  $\Pi$  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 (ii) 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
11. To plot V-I characteristics of a FET

### INSTRUCTIONAL STRATEGY

This subject gives the knowledge of fundamental concepts of basic electronics. The teacher should give emphasis on understanding of concepts and various term used in the subject. The students be made familiar with diodes, transistors, resistors, capacitors, inductors etc. and electrical measuring instruments etc. Practical exercises will reinforce various concepts. Application of Semiconductor Diodes, Transistors, Field Effect Transistors etc must be told to students

## SEMESTER-IV

Course Title: Computer Programming and Application

Course Code: DEE-313

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### LIST OF PRACTICALS

1. Creating database.
2. Querying the database.
3. Report generation.
4. Programming in dbase
5. Use electrical engineering related CAI packages such as Power systems Electrical Drawing etc.
6. Programming for Data Acquisition System and control.
7. Exercises on data acquisition.
8. Exercises on control - on/off switch, and proportional control.
9. Programming exercise on executing C program
10. Programming exercise on editing C program
11. Programming exercise on defining variables and assigning values to variables.
12. Programming exercise on arithmetic and relational operators.
13. Programming exercise on arithmetic expressions and their evaluation.
14. Programming exercise on reading a character.
15. Programming exercise on writing a character.
16. Programming exercise on formatting input using print.
17. Programming exercise on formatting output using scan.
18. Programming exercise on simple if statement.
19. Programming exercise on IF .... else statement.
20. Programming exercise on switch statement.
21. Programming exercise on go to statement.
22. Programming exercise on do-while statement.
23. Programming exercise on for statement.
24. Programming exercise on one-dimensional arrays.
25. Programming exercise on two-dimensional arrays.
26. Exercises on
  - Internet use/application
  - Typical application of various application software's such as MATLAB, PSIM, MULTISIM, PSPICE on Electrical Engineering

### INSTRUCTIONAL STRATEGY

*This course is a highly practical and self- study oriented courses. The teachers are expected to explain the theoretical part and make the students to execute and debug different programs. The PC needed to have Turbo C.*

## SEMESTER-III

Course Title: Electrical Engineering Drawing and Design

Course Code: EE-314

L T P

0 0 6

Max. Marks:150

External: 75

Internal Assessment: 75

### **Objective**

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

- i) Read, understand and interpret engineering drawings
- ii) Communicate and co-relate through sketches and drawings
- iii) Prepare working drawings of 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.

### **LIST OF PRACTICALS**

1. Symbols and Signs Conventions.  
Various Electrical and Electronic Symbols, Electrical Signs Conventions as per BIS Standards,
2. Simple light and Fan Circuits ( min 4 Sheets)
  - 2.1 Lights, Fan power points controlled by individual switches.
  - 2.2 One lamp controlled by two switches (staircase circuit)
  - 2.3 Two lamps controlled by three switches (double staircase circuit)
  - 2.4 Circuit using master switch
  - 2.5 Fluorescent tube controlled from one switch
3. Simple Alarm circuits with and without Relays:
  - 3.1 One bell controlled by one push button
  - 3.2 Two ordinary bells (for day and night) used at a distant/ residence
  - 3.3 No. of bells controlled by separate switches
  - 3.4 Bell response circuit using bell and relays
  - 3.5 Bell response circuit of an office (for three rooms)
  - 3.6 Traffic light control system for two-road crossing
4. Design and drawing of panels/ distribution board using MCBs, main switch and change-over switch for
  - domestic loads
  - industrial loads
  - commercial loads

This includes drawing of installation plan and wiring diagram.

- |     |  |                 |     |
|-----|--|-----------------|-----|
| 5.  | Orthographic Projection of Simple Electrical parts               | ( min 5 Sheets) | 5.1 |
|     | Kit -Kat fuse base   |                 |     |
| 5.2 | Kit -Kat fuse carrier  |                 |     |
| 5.3 | Bus bar post   |                 |     |
| 5.4 | Pin type and shackle type insulator                              |                 |     |
| 5.5 | Bobbins of a small transformer/choke—data chart must be supplied |                 |     |
| 5.6 | Stay insulators  |                 |     |
| 5.7 | M.C.B and E.L.C.B.(Earth Leakage Ckt. Breaker)                   |                 |     |
| 5.8 | Brush Holder   |                 |     |

**INSTRUCTIONAL STRATEGY**

Teacher should identify/prepare more exercises on the pattern shown above. The teacher should make the students confident in making drawing and layouts of electrical wiring installations and doing estimation and costing. This capability will lead the students to become a successful entrepreneur. Take the students to field/laboratory and show the material and equipment.

## SEMESTER-III

Course Title: Electrical and Electronics Workshop Practice –I

Course Code: EE-315

L T P

0 0 6

Max. Marks: 150

External: 75

Internal Assessment: 75

### **Objective**

*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.*

### **LIST OF PRACTICALS**

1. Study of electrical safety measures as mentioned in the Electricity Rules and shock treatment including first aid
2. Wire jointing
  - 2.1 Straight married joint
  - 2.2 Technology-joint
  - 2.3 Western union joint
  - 2.4 Britannia joint
  - 2.5 Twist sleeve joint
  - 2.6 Bolted type joint
3. Filling and crimping of thimbles (using hydraulic and hand crimping tool)
4. Wiring of main distribution board with four outgoing circuits for light and fan loads including main switch and fuses (only internal connection)
5. Construction of an extension board with two 5A sockets, one 15A socket controlled by their respective switches, a fuse and indicator
6. Wiring of a switch board containing at least two switches, one fan regulator and one 5/15A socket controlled by their respective switches using piano type switches and matching socket
7. Wiring of a series test lamp board and to use it for finding out simple faults
8. Fault finding and repair of a tube light circuit
9. Wiring and testing of alarm and indicating circuits using relay, push buttons and bells (simple single phase circuits)
10. Assembly of distribution board/ panel using MCB, main switch, changeover switch and ELCB etc.
11. Repair and maintenance of domestic electric appliances, i.e. electric iron, geyser, fan, heat convector, Semi-automatic washing machine, desert cooler, room heater, electric kettle, electric oven, electric furnace etc.
12. Use of data book to know the parameters of a given transistor
11. Battery charger: Repair and maintenance
14. Power supplies: Working Principles of different types of power supplies viz. CVTs, UPS, Stabilizers, SMPS, IC voltage regulator (78 XX, 79XX)

**Note:** At least five electrical appliances as mentioned above be given to a group of 2 students for their repair and maintenance.

## SEMESTER-III

Course Title: Ecology and Environmental Awareness Camp    Max. Marks: 50  
Course Code: EE-316    Internal Assessment: 50  
L   T   P  
0   0   4

### ECOLOGY AND ENVIRONMENTAL AWARENESS CAMP

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

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

1. Basics of ecology, eco system and sustainable development
2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table
3. Sources of pollution - natural and man made, their effects on living and non-living organisms
4. Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms
5. Pollution of air-causes and effects of man, animal, vegetation and non-living organisms
6. Sources of noise pollution and its effects
7. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods, methods of vermicomposting
8. Mining, blasting, deforestation and their effects
9. Legislation to control pollution and protect environment
10. Environmental Impact Assessment (EIA), Elements for preparing EIA statements
11. Current issues in environmental pollution and its control, Global warming  
. Green house gases, non-conventional sources of energy, introduction to clean technology.
12. Introduction to Green buildings, site selection, material efficiency, energy efficiency, water efficiency, building form.



# IV SEMESTER

## SEMESTER-IV

Course Title: Electrical Machines-I

Course Code: EE-401

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### **Objective**

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

### **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**

#### **Introduction to DC Machines**

Main constructional features, Types of armature winding, Function of the commutator for motoring and generation action, Factors determining induced emf, Factors determining the electromagnetic torque, Types of d.c machines, Significance of back e.m.f., the relation between back emf and Terminal voltage, Armature Reaction, Methods to improve Commutation.

### **UNIT-III**

#### **Applications of DC machines**

Performance and characteristics of different types of DC motors, Speed control of dc shunt/series and compound motors, Need of starter, three point dc shunt motor starter and 4 point starter, Applications of DC motors, Faults in DC machines and their remedies, Losses in a DC machine, Determination of losses by Swinburne's test

### **UNIT-IV**

#### **Single Phase Transformers**

Introduction & different types such as shell type and core type etc, 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 – neglecting voltage drop in the windings – Ampere turn balance – its phasor diagram, Mutual and leakage fluxes, leakage reactance, Transformer on load, voltage drops and its phasor diagram, Equivalent circuit, Relation between induced emf and terminal voltage, regulation of a transformer- mathematical relation, Losses in a transformer, Open circuit and short circuit test. Calculation of efficiency, condition for maximum efficiency, Auto transformer construction, working and applications.

## UNIT-V

### Three Phase Transformers

Construction of three phase transformer, Types of three phase transformer i.e. delta-delta, delta-star, star-delta and star-star, Conditions for parallel operation (only conditions are to be studied), On load tap changer, Difference between power and distribution transformer, Cooling of transformer, Accessories of transformers such as: Conservator, breather, Buchholtz relay, Tap-changer (off load and on load).

### RECOMMENDED 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 JB Gupta, SK Kataria and Sons, New Delhi
5. Electrical Machines by Fitzgerald, Kusko, Dumas
6. Electrical machines by Ashfaq Hussain, Dhanpat Rai and Co, New Delhi.
7. Electrical machines by P.S. Bhimbra; Khanna Publishers, New Delhi.

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 80 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER IV

Course Title: Electrical Measurements and Instrumentation

Course Code: EE-402

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### **Objective**

*Diploma holders in Electrical Engineering have to work on various jobs in the field as well as in testing laboratories and on control panels, where be performs the duties of installation, operation, maintenance and testing by measuring instruments. Persons working on control panels in power plants, substations and in industries, will come across the 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 electrical instruments.*

### **UNIT- I**

#### **Introduction to Electrical Measuring Instruments**

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

### **UNIT-II**

#### **Ammeters ,Voltmeters and Wattmeters**

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. Wattmeters (Dynamometer Type): Construction, working principle, merits and demerits of dynamometer type wattmeter, sources of error.

### **UNIT-III**

#### **Energy and Power Measurments**

Construction, working principle, merits and demerits of single-phase and three-phase energy meters. Errors and their compensation. Simple numerical problems. Construction and working principle of maximum demand indicators.

Power Measurements in 3-phase circuits by 2 wattmeter method in balanced and imbalanced circuits and simple problems and three wattmeter method.

### **UNIT-IV**

#### **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. Measurement of Non-electrical Quantities (Introduction only): Basic concept of pressure measurement, flow measurement, level measurement, displacement measurement using transducers.

### UNIT-V

#### Electronic Instruments

Cathode Ray Oscilloscope: Block diagram, working principle of CRO and its various controls. Applications of CRO. Digital multi-meter (only block diagram) and Applications. LCR - Q meters. Study of LCR – Q meters and their applications, Measurement of Temperature: Different types of thermometers, thermocouple, resistance temperature detector

### RECOMMENDED BOOKS

12. Electrical Measurements and Measuring Instruments by Golding and Widdis; Wheeler Publishing House, New Delhi
13. Electrical Measurements and Measuring Instruments by SK Sahdev, Unique International Publications, Jalandhar
14. A Course in Electrical Measurement and Measuring Instruments by AK Sawhney and PL Bhatia; Dhanpat Rai and Sons, New Delhi
15. Electronic Measurements by D. Cooper
16. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi, New Age International (P) Ltd., Publishers, New Delhi
17. Electronics Instrumentation by Umesh Sinha, Satya Publication, New Delhi
18. Basic Electrical Measurements by Melville B. Staut.
19. Electrical Measurement and Measuring Instruments by JB Gupta, SK Kataria and Sons, New Delhi
20. Electrical Measurement and Measuring Instruments by ML Anand, SK Kataria and Sons, New Delhi

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-IV

Course Title: Electronics-II

Course Code: EE-403

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### **Objective**

*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.*

### **UNIT- I**

#### **Multi-Stage Transistor Amplifiers**

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

### **UNIT-II**

#### **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-III**

#### **Tuned Voltage, Feedback and Operational Amplifiers**

Introduction, Series and parallel resonance ( No mathematical derivation), 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

Voltage gain of an amplifier with negative feedback  $A = \frac{A}{1 + \beta A}$

$1 + \beta A$

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 a CE transistor amplifier, Emitter follower and its applications.

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, Familiarization with specifications and pin configuration of IC 741, Block diagram and operation of 555 IC timer.

## UNIT-IV

### 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-V

### Wave-Shaping and Switching Circuits

Concept of Wave-shaping, Wave-shaping circuits: a) R-C differentiating and integrating circuits b) Diode clipping circuits c) Diode clamping circuits d) Applications 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.

### RECOMMENDED BOOKS

1. A text book of Basic Electronics and Linear Circuits by NN Bhargava and others, Tata McGraw 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 of India, New Delhi
5. Electronic Devices Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
6. Electronic Devices and Circuits by Millman and 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
10. Electronic Devices Circuits by JB Gupta, SK Kataria and Sons, New Delhi

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-IV

Course Title: Estimating & Costing in Electrical Engineering

Course Code: EE-404

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### **Objective**

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

### **UNIT- I**

#### **Introduction**

Purpose of estimating and costing, performance for making estimates, preparation of materials 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-II**

#### **Types of wiring**

Cleat, batten, casing-capping and conduit wiring, comparison of different wiring systems, 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 (to be prepared/arranged)

### **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 having similar electrical load)

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, starters, preparation of list of materials, estimating and costing exercises on workshop with single-phase, 3-phase motor load and the light load (3-phase supply system). Service line connections estimate for domestic and Industrial loads (over-head and underground connections) from pole to energy meter.



## UNIT-IV

### Estimating the Material Required

Estimating the material required for:

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

## UNIT-V

### Class Assignments

Draw the electrical ckt. and estimate the quantity of material and total cost for the wiring system used in the hall of **15mx6mx4.5m** high. The hall is to be fitted with light and fan points. Make your own assumptions for no. of fans and light points and other missing data.

A dining hall for student of residential campus. 20mx10mX4m high is to be provided with electric wiring for light, fans socket outlets at suitable places. Draw the plan of the hall and prepare the estimate with cost.

A small workshop of size 15mx8mx4m is to be provided with electrical power connection; the service connections are to be received on one corner of workshop from existing 3-phase 4-wire distribution pole. Draw the installation plan, single line diagram and prepare the estimate of cost and list of material for installation of the following:

One 2HP 3-phase Induction Motor for screw milling machine, One 3HP 3-phase Induction Motor for small lathe, One 5HP 3-phase Induction Motor for milling machine, One 1HP 3-phase Induction Motor for grinder.

A small workshop measure 30mx15m has to be equipped with the following machinery: One 5 HP 3-Phase 400v Induction Motor, One 3 HP 3-Phase 400v Induction Motor, One 1 HP 3-Phase 400v Induction Motor, One 1/2HP 1-Phase 400v Induction Motor.

Draw the installation plan, single line diagram and prepare the estimate of cost and list of material for the above.

More exercises of similar pattern may be given to the students for practice.

### RECOMMENDED BOOKS

1. Electrical Installation, Estimating and Costing by JB Gupta, SK Kataria and Sons, 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
7. Electrical Design Estimating and costing by KBRaina and SK Bhattacharya, Pub: Willey Estern Ltd. New Delhi

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-IV

Course Title: Generic Skills and Entrepreneurship Development

Course Code: ERE- 405

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### **RATIONALE**

Generic Skills and Entrepreneurship Development is one of the courses from “Human Science” subject area. Generic skills have emerged as an important component of employability skills, which enable an individual to become and remain employable over lifetime and to lead happy and prosperous life. Entrepreneurship development aims at developing conceptual understanding for setting-up one’s own business venture/enterprise. This aspect of Human Resource Development has become equally important in the era, when wage employment prospects have become meager.

Both the subject areas are supplementary to each other and soft skills are required to be developed in diploma passouts for enhancing their employability and self confidence.

### **UNIT- I**

#### **Introduction to Generic Skills and Managing Self**

Importance of Generic Skill Development (GSD)

Global and Local Scenario of GSD

Life Long Learning (LLL) and associated importance of GSD.

Knowing Self for Self Development

Self-concept, personality traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.

Managing Self – Physical

Personal grooming, Health, Hygiene, Time Management

Managing Self – Intellectual development

- Information Search: Sources of information
- Listening: Effective Listening
- Speaking: Effective Oral Communication
- Reading: Purpose of reading, different styles of reading, techniques of systematic reading;
- Note Taking: Importance and techniques of note taking
- Writing: Correspondence - personal and business

Managing Self – Psychological

- Stress, Emotions, Anxiety-concepts and significance (Exercises related to stress management)
- Techniques to manage the above

### **UNIT-II**

#### **Managing in Team**

Team - definition, hierarchy, team dynamics

Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background  
Communication in group - conversation and listening skills

### UNIT-III

#### Task Management and Problem Solving

Task Initiation, Task Planning, Task execution, Task close out  
Exercises/case studies on task planning towards development of skills for task management  
Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving  
Different approaches for problem solving.  
Steps followed in problem solving.  
Exercises/case studies on problem solving

### UNIT-IV

#### Entrepreneurship

Introduction  
Concept/Meaning and its need  
Competencies/qualities of an entrepreneur  
Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.

### UNIT-V

#### 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.

#### Project Report Preparation

- Preliminary Project Report
- Techno-Economic Feasibility Report
- Exercises on Preparation of Project Report in a group of 3-4 students

### INSTRUCTIONAL STRATEGY

This subject will require a blend of different teaching and learning methods beginning with lecture method. Some of the topics may be taught using question answer, assignment, case studies or seminar. In addition, expert lectures may be arranged from within the institution or from management organizations. Conceptual understanding of Entrepreneurship, inputs by teachers and outside experts will expose the students so as to facilitate in starting ones own

business venture/enterprise. The teacher will discuss success stories and case studies with students, which in turn, will develop managerial qualities in the students. There may be guest lectures by successful diploma holding entrepreneurs and field visits also. The students may also be provided relevant text material and handouts.

### RECOMMENDED BOOKS

1. Generic skill Development Manual, MSBTE, Mumbai.
  2. Lifelong learning, Policy Brief ([www.oecd.org](http://www.oecd.org))
  3. Lifelong learning in Global Knowledge Economy, Challenge for Developing Countries – World Bank Publication
  4. Towards Knowledge Society, UNESCO Paris Publication
  5. Your Personal Pinnacle of Success by DD Sharma, Sultan Chand and Sons, New Delhi
  6. Human Learning, Ormrod
  7. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
  8. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
  9. Handbook of Small Scale Industry by PM Bhandari
  10. Generic Skills and Entrepreneurship Development by Ishan Publishers (Ambala)
- Generic Skills and Entrepreneurship Development by Poonam Goyal (GBD)-Punjab

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-IV

Course Title: Electrical Machines-I

Course Code: EE-411

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### LIST OF PRACTICALS

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

**(OR)**

- Measurement of the angular displacement of the rotor of a slip-ring induction motor on application of DC to stator of motor winding in sequence and simultaneously to each phase of rotor winding
2. DC machines
    - 2.1 Speed control of dc shunt motor (i) Armature control method (ii) Field control method
    - 2.2 Study of dc series motor with starter (to operate the motor on no load for a moment)
    - 2.3 Determination of efficiency of DC motor by Swinburne's Test at (i) rated capacity (ii) half full load
  3. Transformers (single phase)
    - 3.1 To perform open circuit and short circuit test for determining equivalent circuit parameter of a transformer
    - 3.2 To determine the regulation and efficiency from the data obtained from open circuit and short circuit test at full load
  4. Three-phase transformers
    - 4.1 Checking the polarity of the windings of a three phase transformer and connecting the windings in various configurations
    - 4.2 Finding the voltage and current relationships of primary and secondary of a three phase transformer under balanced load in various configurations conditions

### INSTRUCTIONAL STRATEGY

Electrical machines being a core subject of electrical diploma curriculum, where a student will deal with various types of electrical machines which are employed in industry, 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. Special care has to be taken on conceptual understanding of concepts and principles in the subject. For this purpose exposure to industry, work places, and utilization of various types of electrical machine for different applications may be emphasized. Explanation of practical aspects of the subject will make the students capable of performing various tests on the machines as per latest BIS specifications.

## SEMESTER-IV

Course Title: Electrical Measurements and Instrumentation

Course Code: EE-412

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### LIST OF PRACTICALS

1. Use of analog and digital multimeter for measurement of voltage, current (a.c/d.c) and resistance
2. To calibrate 1-phase energy meter by direct loading method.
3. To measure the value of earth resistance using earth tester.
4. To measure power, power factor in a single-phase circuit, using wattmeter and power factor meter and to verify results with calculations.
5. Measurement of power and power factor of a three-phase balanced load by two wattmeter method.
6. Measurement of voltage and frequency of a sinusoidal signal using CRO and draw wave shape of signal.
7. Measurement of power in a 3 phase circuit using CT, PT and 3-phase wattmeter.
8. Connecting appropriate instruments at the supply of an installation to measure supply voltage, current, frequency, power, maximum demand, Phase sequence, energy consumed (Instruments to be used are Maximum demand Indicator, phase sequence indicator, energy meter, power factor meter, wattmeter, voltmeter, ammeter and frequency meter)
9. Use of LCR meter for measuring inductance, capacitance, resistance and Q meter.

### INSTRUCTIONAL STRATEGY

After making the students familiar with measuring instruments, they should be made conceptually clear about the constructional features and make them confident in making connection of various measuring instruments. Teacher should demonstrate the application of each measuring instrument in laboratory and encourage students to use them independently

## SEMESTER-IV

Course Title: Electronics-II

Course Code: EE-413

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### LIST OF PRACTICALS

1. To measure ,optimum load , output power and signal handling capacity of a push-pull amplifier
2. To observe the effect of negative current feedback on the voltage gain of a single stage transistor amplifier by removing emitter bye-pass capacitor.
3. To measure , voltage gain and input and output impedance for an emitter follower circuit
4. To measure frequency generation in Hartley , Colpitt's, Wein bridge oscillators and phasing oscillator
5. To observe the differentiated and integrated square wave on a CRO for different values of R-C time constant
6. Clipping of one portion of sine-wave using diode
7. Clipping of both portion of sine-wave using: diode and dc source, zener diodes  
Clamping a sine-wave to: Negative dc voltage, Positive dc voltage
8. To generate square-wave using an astable multivibrator and to observe the wave form on a CRO
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
11. To study the pin configuration and working of IC 555 and its use as nonostable and astable multivibrator
12. To study the effect of coupling capacitor on lower cut off frequency and upper cut off frequency by plotting the frequency response curve of two stage RC coupled amplifier.

### INSTRUCTIONAL STRATEGY

The teacher should bring electronic components and devices in the class while taking lectures and explain and make students familiar with them. Also he may give emphasis on practical applications of these devices and components in the field. In addition, the students should be encouraged to do practical work independently and confidently.

## SEMESTER-IV

Course Title: PC Maintenance and Repair

Course Code: EE-414

L T P

0 0 4

Max. Marks: 100

External: 50

Internal Assessment: 50

### Objective

PC is a tool that defines today current age and culture. A right understanding about any tool is 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 functions. 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.

Note:

Since this is a practical type subject, there will be no theory examination. List of practicals are listed below:

### LIST OF PRACTICALS

1. Introduction to Computer hardware components
2. Familiarization with PC assembling and disassembling.
3. BIOS configuration and settings.
4. Installation of Hard-Disk drive including partitioning and formatting.
5. Familiarization with cables i.e. co-axial, UTP and fiber-optic cable and their installation
6. Installation and configuration of dial-up networking for Broad band internet
7. Installation of Windows Operating Systems
8. How to make an E-mail-ID on internet.
9. Installation of a printer on different operating systems.
10. Virus – removal and use of anti-virus down loads etc.
11. Installation of
  - (a) CD or DVD Drive
  - (b) Sound card, Speaker and headphone
  - (c) Printer drivers
  - (d) Software
12. Downloading of various software
13. Recognition of USB port and other parts like thumb drive or Card Reader etc.
14.
  - (a) Replacement of RAM
  - (b) Replacement of Power Supply

### RECOMMENDED BOOKS

1. PC Maintenance and Repair by Mohit Sofat; Ishan Publications, Ambala
2. Computer Networks, A. Tanenbaum, PHI Ltd., New Delhi
3. PC Maintenance and Troubleshooting by “Biglow”
4. PC Upgrading, Maintenance and Troubleshooting Guide by SK Chouhan ; SK Kataria and Sons, New Delhi



## SEMESTER-IV

Course Title: Electrical and Electronic Workshop Practice-II

Course Code: EE-415

L T P

0 0 4

Max. Marks: 100

External: 50

Internal Assessment: 50

### Objective

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, faultfinding, wiring in electrical appliances and installations.

### LIST OF PRACTICALS

1. Types of wiring and to make different light control circuits in the following types of wiring
  - Casing and Capping (PVC) wiring
  - Conduit wiring (surface/concealed)
2. Testing of domestic wiring installation using meggar
3. To carry out pipe/plate earthing for a small house and 3-phase induction motor. Testing the earthing using earth tester
4. Connections of single phase and 3-phase motors, through an appropriate starter and to change their direction of rotation
5. Wiring, testing and fault finding of the following contactor control circuits operating on 3-phase supply:
  - a. Remote control circuits
  - b. Time delay circuits
  - c. Inter locking circuits
  - d. Sequential operation control circuits
6. Winding/re-winding of a fan (ceiling and table) and choke
7. Power cable jointing using epoxy based jointing kits
8. Demonstration of laying of underground cables at worksite
9. Dismantling/assembly of star-delta/DOL starter & slip-ring induction motor starter
10. Dismantling and assembly of voltage stabilizers
11. Repair and Maintenance of Inverter, UPS.
12. Use and working of ELCB.
13. Rewinding of a small Transformer.
14. To realize the regulated power supply by using three terminal voltage regulator ICs such as 7805, 7905, 7915 etc.

## SEMESTER-III

Course Title: Entrepreneurial Awareness Camp

Max. Marks: 50

Course Code: EE-416

Internal Assessment: 50

L T P

0 0 4

### ENTREPRENEURIAL AWARENESS CAMP

This is to be organized at a stretch for two to three days during or at the end of 4<sup>th</sup> semester. Lectures will be delivered on the following broad topics. There will be no examination for this subject.

1. Who is an entrepreneur?
2. Need for entrepreneurship, entrepreneurial career and wage employment
3. Scenario of development of small scale industries in India
4. Entrepreneurial history in India, Indian values and entrepreneurship
5. Assistance from District Industries Centres, Commercial Banks. State Financial Corporations, Small industries Service Institutes, Research and Development Laboratories and other financial and development corporations
6. Considerations for product selection
7. Opportunities for business, service and industrial ventures
8. Learning from Indian experiences in entrepreneurship (Interaction with successful entrepreneurs)
9. Legal aspects of small business
10. Managerial aspects of small business

# V SEMESTER

## SEMESTER-V

Course Title: Electrical Machines-II

Course Code: EE - 501

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### Objective

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

### UNIT- I

#### Synchronous Machines

Main constructional features of Synchronous Machines including 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, 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 on performance of a synchronous motor, Cause of hunting and its prevention, Rating and cooling of synchronous machines, Applications of synchronous machines (as an alternator, as a synchronous condenser)

### UNIT- II

#### Induction Motors

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

### UNIT- III

#### Applications of Induction Motors

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 and blocked rotor test and find efficiency, Speed control of induction motor, conventional and thyristorized, Connection of submersible motor (monoblock), Single phase induction motors; Construction characteristics and applications, Nature of field produced in single phase induction motor.

## UNIT- IV

### Fractional Kilowatt (FKW) Motors

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.

## UNIT- V

### Special Purpose Machines

Construction and working principle, linear induction motor, stepper motor (AC motors), Schrage motor. Introduction to energy efficient motors.

## RECOMMENDED 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.
5. Electrical machine by Fitzgerald
6. Electrical machine by Kuskoan
7. Electrical machine by Umans

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-V

Course Title: Electrical Power-I

Course Code: EE - 502

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### Objective

The majority of the polytechnic passouts who get employment in State Electricity Boards have to perform various activities 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 including 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 Transmission and Distribution of Electrical Power.

### UNIT- I

#### 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 standard tables, 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, Special constructional features of DC transmission 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 AC transmission line, voltage regulation, concept of corona, effects of corona and remedial measures, Use of ACSR(Aluminum conductor steel Reinforced) bundled conductors .

### UNIT- II

#### 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, their advantages and disadvantages, Preparation of estimates for LT and HT overhead distribution lines

### UNIT-III

#### 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/400V pole mounted sub station

## UNIT-IV

### Faults

Common type of faults in overhead and underground systems, symmetrical components, positive, negative and zero sequence networks. Single line to ground fault, double line to ground fault, 3-phase to ground fault open conductor fault calculations for simple system.

## UNIT-V

### Power Factor

Concept of power factor, Reasons and disadvantages of low power factor, Methods for improvement of power factor using capacitor banks, Static VAR, Compensator (SVC), Various Types of Tariffs: Concept of Tariffs, Block rate, flat rate, maximum demand and two part tariffs, Simple problems

## INSTRUCTIONAL STRATEGY

Since this is a descriptive and practice oriented subject, it is suggested that visits to different types of power generating stations and substations including grid stations be arranged and various equipment, accessories and components explained to the students before the actual class room teaching and make them familiar with the equipment and accessories installed over there. There should be at least 3 visits during the semester. The students may be asked to prepare notes while on visit and submit the report and give seminar. In addition, viva-voce be conducted to evaluate the knowledge gained during the field visit.

## RECOMMENDED BOOKS

1. Electrical Power System and Analysis by CL Wadhwa, 3<sup>rd</sup> 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 and Co., New Delhi
5. Electrical Power System by JB Gupta, SK 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
8. Electrical Power System by S Channi Singh, Tata McGraw Publishing Co. New Delhi

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-V

Course Title: Industrial Electronics and Control of Drives

Course Code: EE-503

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### Objective

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 compare to the conventional methods. The old magnetic and electrical control schemes have all become obsolete. Electrical diploma holder many times has 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 panels is must for them in order to supervise the work efficiently and effectively. Looking in to usefulness and importance of the subject this has been incorporated in the curriculum.

### UNIT- I

#### Introduction to SCR

- 1.1. Construction and working principles of an SCR, two transistor analogy and characteristics of SCR
- 1.2. SCR specifications and rating
- 1.3. Construction, working principles and V-I characteristics of DIAC, TRIAC and Quadriac
- 1.4. Basic idea about the selection of heat sinks for SCR and TRIACS
- 1.5. Methods of triggering a Thyristor. Study of triggering circuits
- 1.6. UJT, its Construction, working principles and V-I characteristics, UJT relaxation oscillator
- 1.7. Commutation of Thyristors (Concept)
- 1.8. Series and parallel operation of Thyristors
- 1.9. Applications of SCR, TRIACS and Quadriac such as light intensity control, speed control of DC and universal motor, fan regulator, battery charger etc.
- 1.10.  $dv/dt$  and  $di/dt$  protection of SCR.

### UNIT-II

#### Controlled Rectifiers

- 2.1 Single phase half wave controlled rectifier with resistive load and inductive load, concept of free wheeling diode.
- 2.2 Single phase half controlled full wave rectifier (No mathematical derivation)
- 2.3 Single phase fully controlled full wave rectifier bridge (Workshops only)
- 2.4 Single phase full wave centre tapped rectifier (Workshops only)
- 2.5 Three phase full wave half controlled bridge rectifier (Workshops only)
- 2.6 Three phase full wave fully controlled bridge rectifier (Workshops only)

### UNIT-III

#### Inverters, Choppers, Dual Converters and Cyclo Converters

- 3.1 Inverter-introduction, working principles, voltage and current driven series and parallel inverters and applications



- 3.2 Choppers-introduction, types of choppers and their working principles and applications
- 3.3 Dual converters-introduction, working principles and applications
- 3.4 Cyclo-converters- introduction, types, working principles and applications

### UNIT-IV

#### Thyristor Control of Electric Drives

- 4.1 DC drives control (Basic Concept)
- 4.2 Half wave drives
- 4.3 Full wave drives
- 4.4 Chopper drives
- 4.5 AC drives control
- 4.6 Phase control
- 4.7 Variable frequency a.c. drives
- 4.8 Constant V/F application
- 4.9 Voltage controlled inverter drives
- 4.10 Constant current inverter drives
- 4.11 Cyclo convertors controlled AC drives
- 4.12 Slip control AC drives

### UNIT-V

#### Uninterrupted Power Supplies

- 5.1 UPS, Stabilizers, SMPS
- 5.2 UPS online, off line
- 5.3 Storage devices (batteries)

### BOOKS RECOMMENDED

1. Industrial Control Electronics. John Webb, Kevin Greshock, Maxwell, Macmillan International editions.
2. Fundamentals of Power Electronics by S Rama Reddi, Narosa Publishing House Pvt. Ltd, New Delhi
3. Power Electronics, Circuits Devices and Applications by Mohammad H. Rashid
4. Power Electronics by PC Sen
5. Power Electronics by Dr. PS Bhimbhra, Khanna Publishers, New Delhi
6. Industrial Electronics & Control by SK Bhattacharya & S Chatterji, New Age international Publications(P) Ltd, New Delhi
7. Power Electronics by SK Sahdev, Unique International Publication, Jalandhar
8. Fundamentals of Electrical Drives by Gopal K Dubey, Narosa Publishing House Pvt. Ltd, New Delhi
9. Power Electronics and Controls by Samir K Datta, Prentice Hall of India, New Delhi
10. Power Electronics and Controls by sh D.R Arora and Neha Gupta Pub: Malhotra book Depot, Jalandhar

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-V

Course Title: Digital Electronics and Microprocessors

Course Code: EE-504

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### Objective

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 fact, the light and the new world belongs to it. So it is necessary to give the knowledge of digital electronics to the electrical students. Microprocessor is one of the most exciting technological advancement among the semiconductor devices in recent times. It has a tremendous impact on the Industrial processes due to its high reliability, flexibility and control capacity both at the design and the Implementation stages. The decreasing cost with increasing facilities act as catalysts in widening their scope of applications.

### UNIT- I

#### Number Systems, Gates and Boolean Algebra

Decimal, binary, octal and hexa-decimal number systems and their inter-conversion, 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 and Flip Flops

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

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

### UNIT-III

#### A/D and D/A Converter

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

### UNIT-V

#### Microprocessor

Study 8085 microprocessor architecture, pin configuration, bus organisation, registers flags, interrupts, Instruction set of 8085 microprocessor, addressing modes, instruction format.

Writing some simple assembly language programmes. Use of stacks and sub-routines in programming, Interfacing and data transfer between peripheral, I/O and microprocessor, Study of peripheral chips – 8255, Introduction of 16-bit, 32-bit microprocessor, their advantages over 8-bit microprocessor

### UNIT-V

#### Introduction to Micro controllers and PLC

Difference between microprocessor and micro controller, Introduction of 8051 of micro controller, Introduction to PLC, Basic configuration of PLC, Comparison of logic controller

### RECOMMENDED BOOKS

1. Modern Digital Electronics by RP Jain
2. Digital Principles and Electronics by Malvino and Leach
3. Digital Electronics by RL Rokheine
4. Digital Electronics by SN Ali
1. Microprocessor by Ramesh S Goanker, Wiley Eastern Ltd. New Delhi
2. Digital Electronics by T.L. Foyal
7. Digital Electronics by Jamwal
3. Microprocessors Architecture, Programming and Application with 8085/8080A, RS Gaonkar, Wiley Eastern Ltd. New Delhi
9. Introduction to Microprocessors by Aditya Mathur, TMH Publishing Co., New Delhi
10. PLCs .net Website
11. Control of Machines by SK Bhattacharya and Brijinder Singh, New Age Publishers , New Delhi

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-V

Course Title: Energy Management

Course Code: EE-505

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### Objective

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. This course will develop awareness amongst the diploma engineers and will enable them to practice the energy management techniques in whatever field they are engaged in.

### 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.

**RECOMMENDED 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, fertilizer industry, cement industry. CII, Energy Management Cell etc

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-V

Course Title: Electrical Mechanics-II

Course Code: EE-511

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### LIST OF PRACTICALS

- 1 Synchronous machines:
  - 1.1 Demonstration of revolving field set up by a 3-phase wound stator
  - 1.2 Determination of excitation
  - 1.3 Determination of the relationship between the voltage and load current of an alternator, keeping excitation and speed constant
  - 1.4 Determination of regulation and efficiency of an alternator with the help of from the open circuit and short circuit test
  - 1.5 Parallel operation of polyphase alternators and their load sharing
  - 1.6 Determination of the effect of variation of excitation on performance of a synchronous motor
2. Induction Machines:
  - 2.1 Determination of efficiency of a 3 phase Induction Motor by (a) no load test and blocked rotor test (b) direct loading of an induction motor (refer ISI Code/BIS code)
  - 2.2 Determination of effect of rotor resistance on torque speed curve of an induction motor
3. FKW Motors:
  - 3.1 To study the effect of connecting a capacitor on the starting and running of a single-phase- split phase induction motor.
  - 3.2 Reversing the direction of rotation of a ceiling fan

### INSTRUCTIONAL STRATEGY

Teacher should lay-emphasis on development of understanding amongst students about basic principles of operation and control of electrical machines. This may be achieved by conducting quiz tests and by giving home assignments. The teachers should also conduct laboratories classes themselves encouraging each should to perform with his/her own hands and draw conclusions.

## SEMESTER-V

Course Title: Industrial Electronics and Control of Drives

Course Code: EE-512

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### LIST OF PRACTICALS

1. To draw firing characteristics of an SCR
2. To draw firing characteristics of a TRIAC
3. To draw firing characteristics of a DIAC
4. To draw uni-junction transistor characteristics
5. Observe the output wave of an UJT relaxation oscillator
6. Observe the wave shape across SCR and load of an illumination control circuit
7. Fan speed regulator using TRIAC (fabrication of this circuit)
8. Speed-control of a DC shunt motor or universal motor
9. To observe the output wave shape on CRO of a Single phase half controlled full wave rectifier
10. To observe wave shape of single phase fully controlled rectifier.

### INSTRUCTIONAL STRATEGY

The teachers may encourage students to perform practical simultaneously for better understanding of the subjects and verification of theoretical concepts. The various components must be shown to the students for identification and also tested. Practical applications of the various circuits and devices should be discussed in the class. The available video films on the subject must be shown to the students.

## SEMESTER-V

Course Title: Digital Electronics and Microprocessors

Course Code: EE-513

L T P

0 0 1

Max. Marks: 50

External: 25

Internal Assessment: 25

### LIST OF PRACTICALS

1. Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, X-OR gates.
2. Construction of Half Adder using gates
3. Construction of Full Adder using gates
4. Verification of operation of an 8-bit D/A Converter
5. Writing assembly language programme using mnemonics and test them on  $\mu$ P Kit  
(anythree)
  - i) Addition of two 8-bit numbers
  - ii) Subtraction of two 8-bit numbers
  - iii) Multiplication of two 8-bit numbers
  - iv) Division of two 8-bit numbers
  - v) Finding average of N given integer
  - vi) Finding maximum number out of three given numeric
6. Assembly language programming for different applications on 8051 micro controller
7. Ladder diagram programming on PLC (any available version of PLC)

### INSTRUCTIONAL STRATEGY

The digital systems in microprocessors have significant importance in the area of electronics. Adequate competency needs to be developed by giving sufficient practical knowledge in microprocessors (programming as well as interfacing), A/D, D/A converters and other Topics. Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. More emphasis while teaching this subject should be given on practical aspects along with the theory input. Lots of programming exercises may be given to the students. Mini projects based on microprocessor operations may be identified and given to students as assignments.



## SEMESTER-V

Course Title: Minor project Work

Course Code: EE-514

L T P

0 0 4

Max. Marks: 100

External: 50

Internal Assessment: 50

**Note:** The project may be identified at the end of 4<sup>th</sup> semester

### Objective

Realising the great importance of students' exposure to world of work for his professional growth, two spells of industry oriented projects-minor and major have been included in the curriculum. It is necessary that teachers to play a pro-active role in planning and guidance of individual students for optimizing the benefits of the activity in stipulated time.

Minor project work aims at exposing the students to industrial/field practices so as to have an appreciation of size, scale and type of operations; and work culture in the industries. Also the students will be able to correlate concepts, principles and practices taught in the classroom with their application in solving field/industrial problems. The work done in minor project work will also prepare them in taking up problem solving at latter stage under major project work.

Depending upon the interests of the students and location of the organization the student may be asked to:

- a) Study various types of materials being used
- b) Learn and Study various operations/processes
- c) Know about various measuring instruments and test equipment being used
- d) Study the plant layout and material handling in an industry
- e) Have knowledge about production planning and control in an industry
- f) Know about various quality control techniques and safety measures adopted
- h) Prepare list of specifications of equipment and machines used
- i) Disassembly and assembly of motors, transformers available in the industry
- j) Checking of wiring in the control panels

**For effective planning and implementation of the above, it is suggested to:**

- a) Identify adequate number of industrial/field organizations and seek their approval for deputing students for exposure/visits.
- b) Prepare a workbook (which can be used by students) for guiding students to perform definite task during the above mentioned exposure.

- c) Identify teachers who would supervise the students' activities and provide guidance on continuous basis during the above project work

**The components of evaluation will include the following:**

	<b><u>Component</u></b>	<b><u>Weightage</u></b>
a)	Punctuality and regularity	10%
b)	Initiative in learning new things	10%
c)	Relationship with others/workers	10%
d)	Project Report/ Technical report	50%
e)	Seminar based on Project	20%

Course Title: Industrial Training

Max. Marks: 100

Course Code: EE-515

Internal Assessment: 100

L T P

0 0 4

## **INDUSTRIAL TRAINING OF STUDENTS** (during summer vacation after IV Semester)

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of a minimum of 6 weeks duration to be organised during the semester break starting after second year i.e. after IV Semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. A minimum of one visit per week by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An internal assessment of 50 and external assessment of 50 marks have been provided in the study and evaluation scheme of V Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations. The formative and summative evaluation may comprise of weightage to performance in testing, general behaviour, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry.

Teachers and students are requested to see the footnote below the study and evaluation scheme of IV Semester for further details.

## SEMESTER-V

Course Title: Personality Development Camp

Max. Marks: 50

Course Code: EE-515

Internal Assessment: 50

L T P

0 0 4

This is to be organized at a stretch for two to three days during fifth or sixth semester. Extension Lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this subject.

1. Communication Skills
2. Correspondence and job finding/applying/thanks and follow-up
3. Resume Writing
4. Interview Techniques: In-Person interviews; telephonic interviews, panel interviews; group interviews and video conferencing etc.
5. Presentation Techniques
6. Group Discussions Techniques
7. Aspects of Personality Development
8. Motivation
9. Leadership
10. Stress Management
11. Time Management
12. Interpersonal Relationship
13. Health and Hygiene

# VI SEMESTER

## SEMESTER-V

Course Title: Utilization of Electrical Energy (UEE)

Course Code: EE-601

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### Objective

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

### UNIT-I

#### Electric Drives

Advantages of electric drives, Characteristics of different mechanical loads, Types of motors used as electric drive, Electric braking, Plugging, Rheostatic braking, Regenerative braking, Methods of power transfer by direct coupling by using devices like belt drive, gears, chain 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 motors, slip ring induction motors, AC series motors, Fractional KW(FKW) motors

### UNIT-II

#### Electric Illumination and Heating

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 numerical.

Different type of lamps, construction and working of incandescent and discharge lamps – their characteristics, fittings required for filament lamp, mercury vapour sodium lamp, fluorescent lamp, halogen lamp, neon lamp.

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 time switches 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 ovens, their temperature range, properties of resistance heating elements, domestic water heaters and other heating appliances, thermostat control circuit,

Induction heating; principle of core type and coreless induction furnace, their construction and applications.

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 and its applications.

Simple design problems of resistance heating element

### UNIT- III

#### **Electric Welding and Electrolytic Processes:**

Advantages of electric welding.

Welding method: Principles of resistance welding, types – spot, projection, seam and butt welding, welding equipment.

Principle of arc production, electric arc welding, characteristics of arc; carbon arc, metal arc, hydrogen arc welding method and their applications. Power supply requirement. Advantages of using coated electrodes, comparison between AC and DC arc welding, welding control circuits, welding of aluminum and copper.

Introduction to TIG and MIG welding, Need of electro-deposition, Laws of electrolysis, process of electro-deposition - clearing, operation, deposition of metals, polishing and buffing, Equipment and accessories for electroplating, Factors affecting electro-deposition, Principle of galvanizing and its applications, Principles of anodizing and its applications, Electroplating of non-conducting materials, Manufacture of chemicals by electrolytic process,

### UNIT- IV

#### **Electrical Circuits used in Refrigeration, Air Conditioning and Water Coolers:**

Principle of air conditioning, vapour pressure, refrigeration cycle, eco-friendly refrigerants, Description of Electrical circuit used in : Refrigerator, Air-conditioner and 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 line and their speed-time curves, Different accessories for track electrification; such as overhead centenary wire, conductor rail system, current collector-pantograph, Factors affecting scheduled speed, Electrical block diagram of an electric locomotive with description of various equipment and accessories used, Types of motors used for electric traction, Starting and braking of electric locomotives, Introduction to EMU and metro railways

**RECOMMENDED 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. Utilization of Electrical Energy by Sahdev, Unique International Publication, Jalandhar
4. A Text Book of Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi
5. Modern Electric Traction by H Partap, Dhanpat Rai & Sons, Delhi
6. Utilization of Electrical Energy by OS Taylor, Pitman Publications
7. Generation, Distribution and Utilization of Electrical Power by CL Wadhwa, Wiley Eastern Ltd., New Delhi

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit



## SEMESTER-VI

Course Title: Programmable Logic Controller & Microcontrollers

Course Code: EE-602

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### Objective

A diploma holder when employed in automated industrial process controls or in automated power station will be required to know the basics of Programmable Logic Controllers, their working and their programming. In industry, many manufacturing processes demand a sequence of operation, which are to be performed repetitively. Early automation systems were mechanical in design, timing and sequencing being effected by gears and cams. Slowly these design concepts were replaced by electrical drives which were controlled by relays and now by programmable logic controllers (PLCs). A PLC is a solid state device, designed to operate in noisy industrial environments and can perform all logic functions. PLCs are widely used in all industries for efficient control operations. A diploma holder in industry is called upon to design, modify and troubleshoot such control circuits. Looking at the industrial applications of PLCs in the modern industry, this subject finds its usefulness in the present curriculum.

Microcontrollers have also assumed great significance in the field of electronics and comma goods industry, and thus considered to be an important field of engineering. This subject aims to expose the students to both of these and give them adequate knowledge of these topics.

### UNIT- I

#### Introduction to PLC

What is PLC, concept of PLC, Building blocks of PLC, Functions of various blocks, limitations of relays. Advantages of PLCs over electromagnetic relays. Different programming languages, PLC manufacturer etc.

Working of PLC- Basic operation and principles of PLC, Architectural details processor, Memory structures, I/O structure, Programming terminal, power supply

Applications of PLCs- Assembly, Packaging, Process controls, Car parking, Doorbell operation, Traffic light control, Microwave Oven, Washing machine, Motor in forward and reverse direction, Star-Delta, DOL Starters, Paint Industry, Filling of Bottles, Room Automation

### UNIT-II

#### Instruction Set and Instruction Set Addressing Modes

Basic instructions like latch, master control self holding relays.

Timer instruction like retentive timers, resetting of timers.

Counter instructions like up counter, down counter, resetting of counters.

Arithmetic Instructions (ADD,SUB,DIV,MUL etc.)

MOV instruction

RTC(Real Time Clock Function)

Comparison instructions like equal, not equal, greater, greater than equal, less than, less than equal

Timer operation

Serial Port operation

Interrupts

## UNIT-III

Ladder Diagram and Assembly language programming

Programming based on basic instructions, timer, counter, sequencer, and comparison instructions using ladder program.

Assemblers and Compilers

Assembler Directives

## UNIT-IV

Micro Controller Series (MCS)-51 Over View

Pin details

I/o Port structure

Memory Organisation

Special function registers

## UNIT-V

### Design and Interface

Examples like: keypad interface, 7- segment interface, LCD, stepper motor. A/D, D/A, RTC interface.

Introduction of PIC Micro controllers, Application of Micro controllers

## BOOKS RECOMMENDED

- 1) Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA
- 2) Introduction to PLCs by Gary Dunning. McGraw Hill
- 3) Module on PLCs and their Applications by Rajesh Kumar, NITTTR Chandigarh
- 4) Programmable Logic Controller and Microcontrollers by Gurpreet Kaur and SK Sahdev by Uneek Publications, Jalandhar
- 5) Module on "Allen Bradlag PIC (SLC 500), Institution set-1, by Rajesh Kumar, NITTTR, Chandigarh
- 6) Module on "PLC Applications based on SLC 5/03" By Rajesh Kumar, NITTTR Chandigarh
- 7) The 8051 Micro controller by 1 Scot Mackenzie, Prentice Hall International, London
- 8) The 8051 Micro controllers Architecture, programming and Applications by Ayala; Penram International
- 9) Process Control Instrumentation Technology by Johnson, Curits; EE Edition, Prentice Hall of India, New Delhi
- 10) Microcontrollers by Ayala
- 11) Microcontrollers by Mazidi
- 12) Microcontrollers by Neil Makanzie
- 13) Microcontrollers by Deshmukh

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-VI

Course Title: Electrical Power-II

Course Code: EE-603

L T P

4 0 0

Max. Marks: 100

External: 60

Internal Assessment: 40

Duration of Exam: 3 Hrs

### Objective

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 substations, power stations and well designed laboratory experiences. A practice-oriented approach to the teaching of this subject is suggested.

### UNIT- I

#### Power Generation and its Economics

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.

Economics of Generation: Fixed and running cost, load estimation, load curves, demand factor, load factor, diversity factor, power factor and their effect on cost of generation, simple problems there on, Base load and peak load power stations, inter-connection of power stations and its advantages, concept of regional and national grid.

### UNIT- II

#### Switch Gears

Purpose of protective gear. Difference between switch, isolator and circuit breakers. Function of isolator and circuit breaker. Making capacity and breaking capacity of circuit breaker (only definition)

Principles of Arc extinction in 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, SF<sub>6</sub> circuit breakers, Miniature circuit breakers (MCB) and ELCB 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, method of earthing, Equipment earthing, Substation earthing, system earthing as per Indian Electricity rules. Methods of reducing earth resistance.

Relays: Introduction- types of relays. Electromagnetic and thermal relays, their construction and working, Induction type over-current, earth fault relays, instantaneous over current relay, Directional over-current, differential relays, their functions, Distance relays their functions, Idea of static relays and their applications.

### UNIT- IV

#### Protection Scheme

Relays for generator protection, Relays for transformer, protection including Buchholtz relay protection, Protection of feeders and bus bars. Over current and earth fault protection, Distance protection for transmission system, Relays for motor protection

### UNIT- V

#### Over-voltage Protection

Protection of system against over voltages, causes of over voltages, utility of ground wire, Lightning arrestors, Rod gap, horn gap, metal oxide type, Transmission Line and substation protection against over-voltages and lightning.

Note: Students may be taken to various Sub-stations/ Grid Stations. Students must be familiarized with present tariff system employed by State Electricity Boards.

### RECOMMENDED BOOKS

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

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-VI

Course Title: Installation and Maintenance of Electrical Equipment	Max. Marks: 100
Course Code: EE-504	External: 60
L T P	Internal Assessment: 40
4 0 0	Duration of Exam: 3 Hrs

### Objective

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.

### UNIT- I

#### Tools, accessories and domestic installation

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

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

### UNIT-II

#### Installation of transmission and Distribution Lines:

Erection of steel structures, connecting of jumpers, tee-off points, joints and dead ends; 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, bird guards, anti-climbing devices and danger plates; sizes of conductor, earth wire and guy wires, Testing and Commissioning.

Laying of service lines, earthing, provision of service fuses, installation of energy meters

### UNIT-III

#### Laying of Underground Cables, Inspection and Testing of Electrical Equipment

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, 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.

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

### UNIT-IV

#### **Maintenance of Electrical Equipment**

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, 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

### UNIT-V

#### **Maintenance of Grid Substations, motors and Domestic Installations**

Checking and maintenance of busbars, isolating switches, HT/LT circuit breakers, LT switches. Power transformers, Maintenance of Motors: Over hauling of motors, preventive maintenance, trouble shooting of electric motors

### RECOMMENDED 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

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-VI

Course Title: Basics of Management  
Course Code: CE/EE/ME/ECE -605  
L T P  
4 0 0

Max. Marks: 100  
External: 60  
Internal Assessment: 40  
Duration of Exam: 3Hrs

### **Objective**

The diploma holders are generally expected to take up middle level managerial positions, their exposure to basic management principles is very essential. Topics like Structure of Organization, Leadership, Motivation, Ethics and Values, Customer Relationship Management (CRM), Legal Aspects of Business, Total Quality Management (TQM), Intellectual Property Rights (IPR) etc. have been included in the subject to provide elementary knowledge about these management areas.

### **UNIT- I**

#### **Principles of Management**

Introduction, definition and importance of management.

Functions of Management: Planning, Organizing, Staffing, Coordinating, Directing, Motivating and Controlling

Concept and Structure of an organization

Types of industrial organization

- a) Line organization
- b) Functional organization
- c) Line and Functional organization

Hierarchical Management Structure: Top, middle and lower level management

Departmentalization: Introduction and its advantages.

### **UNIT- II**

#### **Leadership and Motivation**

Leadership

- a) Definition and Need of Leadership
- b) Qualities of a good leader
- c) Manager vs. leader

Motivation

- d) Definition and characteristics of motivation
- e) Factors affecting motivation
- f) Maslow's Need Hierarchy Theory of Motivation

Job Satisfaction

**UNIT -III**

**Introduction and need of Legal Aspects of Business and Work Culture:**

Labour Welfare Schemes

- a) Wage payment : Definition and types
- b) Incentives: Definition, need and types

Factory Act 1948

Minimum Wages Act 1948

Introduction and importance of Healthy Work Culture in organization

Components of Culture

Importance of attitude, values and behaviour

Behavioural Science – Individual and group behaviour

Professional ethics – Concept and need of Professional Ethics

**UNIT -IV**

**Management Scope in different Areas**

Human Resource Development

- a) Introduction and objective
- b) Manpower Planning, recruitment and selection
- c) Performance appraisal methods

Material and Store Management

- a) Introduction, functions and objectives of material management
- b) Purchasing: definition and procedure
- c) Just in time (JIT)

Marketing and Sales

- a) Introduction, importance and its functions
- b) Difference between marketing and selling
- c) Advertisement- print media and electronic media
- d) Market-Survey and Sales promotion.

Financial Management – Introduction

- a) Concept of NPV, IRR, Cost-benefit analysis
- b) Elementary knowledge of Income Tax, Sale Tax, Excise duty, Custom duty, Provident Fund

Maintenance Management

- a) Concept
- b) Preventive Maintenance

**UNIT -V**

**Miscellaneous topics**

Customer Relationship Management (CRM)

- a) Definition and Need
- b) Types of CRM
- c) Customer satisfaction

Total Quality Management (TQM)

- a) Inspection and Quality Control
- b) Concept of Quality Assurance
- c) TQM



### Intellectual Property Rights ( IPR)

- a) Introduction, definition and its importance
- b) Infringements related to patents, copyright, trade mark

### INSTRUCTIONAL STRATEGY

It is observed that the diploma holders generally take up middle level managerial positions, therefore, their exposure to basic management principles is very essential. Accordingly students may be given conceptual understanding of different functions related to management. Some of the topics may be taught using question answer, assignment or seminar method. The teacher will discuss success stories and case studies with students, which in turn, will develop appropriate managerial qualities in the students. In addition, expert lectures may also be arranged from within the institutions or from management organizations. Appropriate extracted reading material and handouts may be provided.

### RECOMMENDED BOOKS

1. Principles of Management by Philip Kotler TEE Publication
2. Principles and Practice of Management by Shyamal Bannerjee: Oxford and IBM Publishing Co, New Delhi.
3. Financial Management by MY Khan and PK Jain, Tata McGraw Hill Publishing Co., 7, West Patel Nagar , New Delhi.
4. Modern Management Techniques by SL Goel: Deep and Deep Publications Pvt Limited , Rajouri Garden, New Delhi.
5. Management by James AF Stoner, R Edward Freeman and Daniel R Gilbert Jr. : Prentice Hall of India Pvt Ltd, New Delhi.
6. Essentials of Management by H Koontz, C O' Daniel , McGraw Hill Book Company, New Delhi.
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by DD Sharma, Sultan Chand and Sons, New Delhi.
9. Intellectual Property Rights and the Law by Dr. GB Reddy.
10. Service Quality Standards, Sales & Marketing Department, Maruti Udyog Ltd.
11. Customer Relationship Management: A step-by-step approach, Mohamed & Sagadevan Oscar Publication, Delhi

**NOTE FOR PAPER SETTER:** The question paper shall comprise of 60 marks. Two questions will be set from each unit. The student has to attempt five questions, at least one from each unit

## SEMESTER-VI

Course Title: Programmable Logic Controllers & Microcontroller

Course Code: EE-611

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

### ***LIST OF PRACTICALS***

#### ***PLCs***

1. Components/sub-components of a PLC, Learning functions of different modules of a PLC system
2. Practical steps in programming a PLC (a) using a Hand held programmer (b) using computer interface
3. Introduction to step 5 programming language, ladder diagram concepts, instruction list syntax
4. Basic logic operations, AND, OR, NOT functions
5. Logic control systems with time response as applied to clamping operation
6. Sequence control system e.g. in lifting a device for packaging and counting
7. Use of PLC for an application( teacher may decide)

#### ***Micro Controllers***

1. Familiarization with a study of Architecture of 8085 kit, basic sub systems and input output connectors, functions keys on micro controllers kit
2. Familiarization of Micro Controllers (8051) kit
3. Testing of general input/output on Micro controller board
4. Development of Electrical , Instrumentation applications using 8051 micro-controller

### **INSTRUCTIONAL STRATEGY**

Introduce the subject and make the students familiar with applications of PLCs and Microcontrollers. The inputs shall start with theoretical inputs to architecture, instruction set, assembly language programming, Small projects may be identified, be designed and implemented. PLC ladder diagram and programming should be supplemented with visits to industry. More emphasis may be given to practical work.

**SEMESTER-VI**

Course Title: Electrical Power-II

Course Code: EE-612

L T P

0 0 2

Max. Marks: 50

External: 25

Internal Assessment: 25

**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
2. Working of different types of circuit breakers and isolators
3. Working of different types of protective relays
4. Working of CTs and PTs
5. Earthing of different equipment
6. Testing of MCB as per IS specifications

## SEMESTER-VI

Course Title: Major Project Work

Course Code: EE-613

L T P

0 0 6

Max. Marks: 300

External: 150

Internal Assessment: 150

### Objective

Project work aims at developing skills in the students whereby they apply in totality the knowledge and skills gained through the course in the solution of a practical problem undertaken as a project work. The students have different 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 departments 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 themselves or be given project assignment at least two to three months in advance. The project work identified in collaboration with industry/field organization should be preferred.

Each teacher is expected to guide the project work of 5-6 students at a time. 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
- h) Projects related to wastage reduction
- i) Projects related to energy audit

For Students of Electrical Engineering Diploma Programme the project work can be grouped under the following four groups. A number of projects have been mentioned under each section. A student should take at least two projects both of which should not be from the same group. If more than two projects are taken to make up a total of 256 hours, then more than 1 may be taken from the same group as long as at least two groups are covered. A student is read to choose one project from each section.

Report for all the four project should be prepared and will give a seminar. The same will be assessed for internal and external assessment.

### 1.1 Electrical Machines and Equipment:

- 1.1.1 Construction of a small transformer (500 VA or so)
- 1.1.2 Construction of phase sequence indicator

- 1.1.3 Construction of hot air drier
- 1.1.4 Construction of a Simple loop generator
- 1.1.5 Design and fabrication of Automatic curtain operator
- 1.1.6 Construction of Automatic Star-Delta starter
- 1.1.7 Construction of Automatic Water level controller
- 1.1.8 Balancing of load of an indoor distribution transformer
- 1.1.9 Construction of Choke for fluorescent tubes
- 1.1.10 Design and construction of fan regulators (inductance type)
- 1.1.11 Design and construction of fan regulators (Resistance type)
- 1.1.12 Design and construction of loading rheostats
- 1.1.13 Design and construction of Desert coolers
- 1.1.14 Fabrication of electric motor (FKW)
- 1.1.15 Rewinding of motors upto 5 HP
- 1.1.16 Design and construction of Geyser
- 1.1.17 Electroplating of small domestic gadgets
- 1.1.18 Erection/installation and commissioning of rotating electrical machine
- 1.1.19 Fault detection and repair of electrical/electronic instruments
- 1.1.20 Design and assembly of contactor control circuit for various applications

### 1.2 Electrical Power:

- 1.2.1 Drawing, estimating and costing of electrical installation of the institution from supplier's pole to the institution distribution board. Drawing, estimating and costing of electrical installation of a workshop having a given number of electrically operated appliances/machines.
- 1.2.2 To lay underground distribution cable for a small colony starting from main distribution pole
- 1.2.3 To erect a 5 pole span overhead line for a small distance for distribution of electrical energy. To energize it and prepare list of material and cost estimates.
- 1.2.4 To provide a service connection to a consumer's premises for domestic purposes
- 1.2.5 To survey the load of given areas in a village, small colony, calculate the effective load and find out the sizes of the cables/conductors for the proposed distribution system
- 1.2.6 Designing of light and fan scheme for a institutional or commercial building
- 1.2.7 Augmentation of a nearby pole mounted sub station

### 1.3 Electronic Based Projects:

Fabrication of:

- 1.3.1 Voltage Stabilizer for refrigerator, air-conditioner
- 1.3.2 Emergency light using SCR
- 1.3.3 Power amplifier
- 1.3.4 Low cost intercom for home
- 1.3.5 Analog computer
- 1.3.6 Regulated power supply (+ 12V and + 6V) using 7812, 7912 & 7806, 7906
- 1.3.7 Automatic battery charger using SCR

- 1.3.8 Battery operated tube light
- 1.3.9 Solid state fan regulator
- 1.3.10 Burglar Alarm
- 1.3.11 Hearing aid
- 1.3.12 Automatic street light/dressing table light
- 1.3.13 Mosquito Repeller
- 1.3.14 Inverter circuit 500- 1000 watt.

### 1.4 Power Electronics based projects

Fabrication and Testing of:

- 1.4.1 Inverter/Emergency light circuit using power transistors
- 1.4.2 SCR based automatic battery charger
- 1.4.3 SCR operated illumination controller
- 1.4.4 SCR operated automatic water level controller
- 1.4.5 SCR based speed controller for DC shunt motor
- 1.4.6 Three phase full wave rectifier using power diodes
- 1.4.7 Timer circuit using 555-IC
- 1.4.8 SCR controlled rectifier circuit
- 1.4.9 Speed control circuit of DC shunt motor using SCR
- 1.4.10 inverting and non-inverting amplifiers using OP AMP (741)
- 1.4.11 Comparator circuits using OP AMP (741)

### 1.5 Market Survey for Different Types of Electrical Items with Specifications

- 1.5.1 MCBs
- 1.5.2 Iron clad Main Switch Electrodes
- 1.5.3 Accessories including wires and cables used for household installation
- 1.5.4 Special purpose Cables, Teflon, paper insulated etc.
- 1.5.5 Starters for three phase and single phase induction motors of different makes (e.g Seimen, Crompton, Havels, and Hind Electrical etc).

### Performance Criteria for Evaluation:

Sense of Responsibility	20%
Inter Personal Skill	10%
Self Expression	10%
Report Writing	30%
Viva Voce	30%

## SEMESTER-VI

Course Title: Student Centred Activities

Max. Marks: 50

Course Code: EE-614

Internal Assessment: 50

L T P

0 0 4

SCA will comprise of co-curricular activities like extension lectures, library studies, games, hobby clubs e.g. photography, painting, singing, seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, Civil Defence/ Disaster Management activities etc.