

# **Program Syllabus Booklet**

## **Diploma in Electrical Engineering (Code-125)**



**Session: 2020-21**

GURU KASHI UNIVERSITY										
Guru Gobind Singh College of Engineering & Technology (Code:1)										
Diploma in Electrical Engineering (Code: 125)										
Study Scheme										
Semester: 1st										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	120101	Applied Chemistry – I	T	4	0	0	4	50	50	100
2	120102	Applied Mathematics - I	T	5	0	0	5	50	50	100
3	120103	Applied Physics – I	T	4	0	0	4	50	50	100
4	120104	English and Communication Skills – I	T	3	0	0	3	50	50	100
5	123101	Engineering Drawing – I	T/P	2	0	6	5	50	50	100
6	120105	Applied Chemistry – I Lab	P	0	0	2	1	50	50	100
7	120106	Applied Physics – I Lab	P	0	0	2	1	50	50	100
8	120107	English and Communication Skills – I Lab	P	0	0	2	1	50	50	100
9	120108	General Workshop Practice – I	P	0	0	6	3	50	50	100
Total No. of Credits				27						

\* Common Course with all other diploma programmes.

Semester: 2nd										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	120201	*English and Communication Skills –II	T	4	0	0	4	50	50	100
2	120202	*Applied Mathematics -II	T	5	0	0	5	50	50	100
3	120203	*Applied Physics-II	T	4	0	0	4	50	50	100
4	120204	**Applied Chemistry –II	T	4	0	0	4	50	50	100
5	120205	*English and Communication Skills –II Lab	P	0	0	2	1	50	50	100
6	120206	*Applied Physics-II Lab	P	0	0	2	1	50	50	100
7	120207	**Applied Chemistry –II Lab	P	0	0	2	1	50	50	100
8	121202	# Basics of Information Technology Lab	P	0	0	4	2	50	50	100
9	123201	**Engineering Drawing-II	T/P	2	0	6	5	50	50	100
10	120208	*General Workshop Practice -II	P	0	0	6	3	50	50	100
Total No. of Credits				30						

\*Common Course with other diploma programmes

\*\* Common course with diploma program in Civil Engg. & ME

# Common course with diploma program in Civil Engg. , ME, ECE , 1st sem of CSE & IT.

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Study Scheme										
Semester: 3rd										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	125301	Fundamentals of Electrical Engineering	T	4	0	0	4	50	50	100
2	122309	Electronics – I	T	5	0	0	5	50	50	100
3	125302	Electrical and Electronics Engineering Materials	T	4	0	0	4	50	50	100
4	121310	*Computer Programming and Applications	T	3	0	0	3	50	50	100
5	125303	Electrical Engineering Design and Drawing	T/P	2	0	6	5	50	50	100
6	125304	Electrical Workshop Practice – I	P	0	0	2	1	50	50	100
7	125305	Fundamentals of Electrical Engineering Lab	P	0	0	2	1	50	50	100
8	122310	Electronics – I Lab	P	0	0	2	1	50	50	100
9	121311	*Computer Programming and Applications Lab	P	0	0	2	1	50	50	100
Total No. of Credits				25						

\* Common course with diploma program in ECE.

Semester: 4th										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	125401	Electrical Machines – I	T	4	0	0	4	50	50	100
2	125402	Electrical Measuring Instruments and Instrumentation	T	5	0	0	5	50	50	100
3	122410	Electronics –II	T	4	0	0	4	50	50	100
4	125403	Estimating and Costing in Electrical Engineering	T	3	0	0	3	50	50	100
5	120401	*Generic Skills and Entrepreneurship Development	T	3	0	0	3	50	50	100
6	121406	P.C. Maintenance and Repair Lab	P	0	0	6	3	50	50	100
7	125404	Electrical Workshop Practice–II	P	0	0	2	1	50	50	100
8	125405	Electrical Machines – I Lab	P	0	0	2	1	50	50	100
9	125406	Electrical Measuring Instruments and Instrumentation Lab	p	0	0	2	1	50	50	100
10	122411	Electronics –II Lab	p	0	0	2	1	50	50	100
Total No. of Credits				26						

\*Common Course with diploma programmes in IT, CSE, ECE, ME & 5th sem of Civil Engg

GURU KASHI UNIVERSITY										
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Diploma in Electrical Engineering (Code: 125)										
Study Scheme										
Semester: 5th										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	125501	Electrical Machines – II	T	4	0	0	4	50	50	100
2	125502	Electrical Power-I	T	5	0	0	5	50	50	100
3	125503	Industrial Electronics and Control of Drives	T	4	0	0	4	50	50	100
4		<b>Elective – I</b>	T	3	0	0	3	50	50	100
5	122511	Digital Electronics and Microprocessors	T	4	0	0	4	50	50	100
6	125505	Non- Conventional Energy Sources	T	4	0	0	4	50	50	100
7	125506	Minor Project Work Lab	P	0	0	2	1	50	50	100
8	125507	Electrical Machines – II Lab	P	0	0	2	1	50	50	100
9	125508	Industrial Electronics and Control of Drives Lab	p	0	0	2	1	50	50	100
10	122512	Digital Electronics and Microprocessors Lab	p	0	0	2	1	50	50	100
Total No. of Credits				28						

Choose any one Elective from the following:

Elective-I	
122504	Instrumentation
122602	Optical Fibre Communication

Semester: 6th										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	125601	Utilization of Electrical Energy(UEE)	T	4	0	0	4	50	50	100
2	122612	Programmable Logic Controllers and Microcontrollers	T	5	0	0	5	50	50	100
3	125602	Electrical Power – II	T	4	0	0	4	50	50	100
4		<b>Elective-II</b>	T	3	0	0	3	50	50	100
5	120601	*Basics of Management	T	4	0	0	4	50	50	100
6	125605	Major Project	P	0	0	8	4	50	50	100
7	122613	Programmable Logic Controllers and Microcontrollers Lab	P	0	0	2	1	50	50	100
8	125606	Electrical Power – II Lab	P	0	0	2	1	50	50	100
Total No. of Credits				26						

Choose any one Elective from the following:

Elective-II	
125603	Modern Electric Traction
125604	Energy Management

\*Common with diploma programs in IT, CSE, ECE, ME

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**APPLIED CHEMISTRY-I (120101)**

**Credits- 04**

**L T P**

**4 0 0**

**Course 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 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 apply applied aspects of chemistry. In order to educate and train Engineers and skilled work force applied chemistry syllabus for diploma students in various engineering and technology courses is designed to develop scientific temper and appreciate physical and chemical properties of engineering materials, which are used in their professional career. Best efforts should be made to teach and train the skilled engineers and work force by imparting essential knowledge required from this subject through demonstrations, and minor projects.

**1. Basic Concepts of Chemistry**

- 1.1 Units and Dimensions, dimensional formulas- dimensional analysis principle of homogeneity of dimensions and their limitations, derived units (with special reference to pressure, volume, temperature, density, specific gravity, surface tension, viscosity and conductivity, thermodynamic parameters-significance and applications)
- 1.2 Matter, element, compound and mixtures, atoms, molecules, ions, symbols and formulae, Atomic mass (A), atomic number (Z) isotopes, isobars, isotone (recapitulation only)
- 1.3 Mole concept, solution, standard solution, methods to express concentration of solution
  - 1.3.1 Molar mass, molar volume of gases, strength of solutions in grams per liter, molarity (M), molality (m), mass and volume percentages and mole fraction
- 1.4. Chemical equations, thermo-chemical equations, balancing of chemical equations and simple stoichiometric calculations.
- 1.5 Numerical problems based on mole concept and molarity.

**2. Atomic Structure, Periodic Table and Chemical Bonding**

- 2.1 Fundamental particles- electrons, protons and neutrons
- 2.2 Bohr's model of atom and its limitations (qualitative treatment only).
- 2.3 Wave particle duality and Heisenberg's uncertainty principle (elementary)

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idea only)

- 2.4 Modern concept of atom, definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers (significance only), electronic configuration of elements up to atomic number 30 on the basis of Aufbau Principle, Pauli's Principle and Hund's Rule
- 2.5 Modern periodic law and periodic table, groups and periods.
- 2.6 Classification of elements into s, p, d, and f blocks (periodicity in properties are excluded)
- 2.7 Chemical bond and cause of bonding.
- 2.8 Ionic bond, valence bond approach of covalent bond, hybridization ( $sp^3$ ,  $sp^2$  and  $sp$ ) sigma ( $\sigma$ ) and pi ( $\pi$ ) bonds.
- 2.9 Metallic bonding – electric, magnetic and dielectric properties based on Band model

### **3. Water**

- 3.1 Sources of water, impurities in water (dissolved –gases, salts and suspended),
- 3.2 Hardness of water, types of hardness, degree of hardness, units of hardness-ppm,  $^{\circ}Cl$ ,  $^{\circ}Fr$  – numerical problems
- 3.3 Disadvantages of using hard water in domestic and in industries: Laundry work (action of soap on water), paper, textile and beverage industries.
- 3.4 Boiler feed water and its quality - causes and prevention of
  - 3.4.1 Scale and sludge formation,
  - 3.4.2 Priming and foaming
  - 3.4.3 Boiler corrosion,
  - 3.4.4 Caustic embitterment
- 3.5 Softening of hard water by
  - 3.5.1 Ion exchange process- dematerialized water advantages and limitations of this method
  - 3.5.2 Desalting of sea water by reverse osmosis (RO) method
  - 3.5.3 Calgon process
- 3.6 Characteristics of drinking water and ICMR, ISI –quality criteria
- 3.7 Water analysis: Quantitative analysis of hardness by EDTA method, alkalinity, and estimation of total dissolved solids (TDS)-numerical problems
- 3.8 Enlist applications of various kinds of water in engineering and chemical industry.

### **4. Gas laws, Terminology of Thermodynamics and Equilibrium**

- 4.1 Definition of gas and perfect gas, gas laws- Boyle's Law, Charles law & Avagadro's law, Gas constant (R).
- 4.2 Terminology of Thermodynamics- thermodynamic system, surroundings, types of systems, extensive and intensive properties, state of a system, state functions, isothermal, adiabatic reversible, irreversible spontaneous and non spontaneous processes, meaning of  $\Delta E$ ,  $\Delta H$ ,  $\Delta S$  and  $\Delta G$ , free energy of spontaneous and non spontaneous processes (mathematical derivations are

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excluded)

- 4.3 Elementary idea of zeroth, 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> laws of thermodynamics (without mathematical derivation)
- 4.4 Applications of free energy change ( $\Delta G$ ) criteria (in metallurgy and electric work without any mathematical derivation)
- 4.5 Equilibrium state and its significance statement of Le-Chatelier's principle, equilibrium constant ( $K$ ) and its applications..
- 4.6 Electrolytes, non electrolytes, ionization in aqueous solutions, degree of ionization, ionic product of water ( $K_w$ )
- 4.7 Concept of pH, pH- scale and industrial applications of pH
- 4.8 Definitions - acids, bases, neutralization and acid base titrations, indicators and choice of indicators for acid base titration.
- 4.9 Buffer (acidic, basic and neutral) solutions, enlist applications of buffer solution
- 4.10 Simple numerical problems (only on 4.1, 4.5. 4.6 and 4.7 sections)

**5. Electrochemistry**

- 5.1 Electronic concept of oxidation and reduction, redox reactions
- 5.2 Electrolytes, non-electrolytes and electrolysis,
- 5.3 Faraday's Laws of electrolysis and applications in electrometallurgy and electroplating in automobile
- 5.4 Standard reduction potential (SRP), activity series, electrochemical cell and their e.m.f
- 5.5 Chemistry of commercial electrochemical cells
  - 5.5.1 primary cells - Daniel cell and dry cell
  - 5.5.2 secondary cell - lead acid storage cell, Wetson-cadmium cell, nicad battery, LiI battery, Hg – button cell and Ag- button cell
  - 5.5.3 Fuel cells
- 5.6 Simple numerical problems related (to only 5.1, 5.3 and 5.4 sections).

**6. Organic Chemistry**

- 6.1 Tetra covalency of carbon in carbon compounds, catenation (definition only)
- 6.2 Classification of organic compounds on the bases of functional group
- 6.3 IUPAC nomenclature of simple organic compounds (containing one functional group only) and their common names (if any)

**RECOMMENDED BOOKS**

1. Chemistry in Engineering by J.C. Kuricose and J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Engineering Chemistry by Shashi Chawla.
4. Progressive Applied Chemistry – I by Dr. G.H. Hugar Eagle Prakashan, Jalandhar
5. Engineering Chemistry – A text Book by H. K. Chopra and A Parmer- Narosa Publishing House New Delhi.

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6. Applied Chemistry-I by Dr.P.K. Vij & Shiksha Vij, Lords Publications, Jalandhar
7. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, a unit of Krishna Prakashan Pvt. Ltd. Meerut, India, (year 2008)
8. Rapid Chemistry for peak performance by Anil Ahlawat, MTE books, 503, Taj Apartments, Ring Road, New Delhi (year 2008)
9. Applied Chemistry (Theory and Practice) by Vermani OP and Narula A.K., Cengage International Pvt. Ltd. New Delhi (year 2008)
10. Engineering Chemistry by Shelli Oberoi and Monica Malik, Cengage International Pvt. Ltd. New Delhi (year 2008)



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**APPLIED MATHEMATICS – I (120102)**

Credits- 05

L T P

5 0 0

**Course 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.

**1. Algebra**

- 1.1 Complex Numbers: Complex number, representation, modulus and amplitude. De-moivre's theorem, its application in solving algebraic equation.
- 1.2 Basics and properties of logarithms and its applications in solving problems related to basic logarithmic formulas.
- 1.3 Geometrical progression, its nth term and sum of n terms and to infinity. Application of Arithmetic progression and Geometrical progression to Engineering problem such as maximum possible output of the machine, vibration of the spring, finding out capacity of tank etc.
- 1.4 Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors excluding repeated factors)
- 1.5 Permutations and Combinations: Value of  $nPr$   $nCr$ . Simple problems of formulation of words from given alphabets (with and without repetition), circular permutations etc.
- 1.6 Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof) first and second binomial approximation with applications to engineering problems

**2. Trigonometry**

- 2.1 Concept of angles, measurement of angles in degrees, grades and radians and their conversions. Applications of angles such as angle subtended by an arc, diameter of moon etc.
- 2.2 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 ( $2A$ ,  $3A$ ,  $A/2$ ).
- 2.3 Graphs of  $\sin x$ ,  $\cos x$ ,  $\tan x$  and  $e^x$
- 2.4 Applications of Trigonometric terms in engineering problems such as to find an angle of elevation, height, distance etc.

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**3. Co-ordinate Geometry**

- 3.1 Cartesian and Polar coordinates (two dimensional), conversion from cartesian to polar coordinates and vice-versa, distance between two points (cartesian co-ordinates), section formulae
- 3.2 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.
- 3.3 Equation of straight line in various standard forms (without proof), inter section of two straight lines, angle between two lines. Parallel and perpendicular lines, perpendicular distance formula
- 3.4 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
- 3.5 Equation(s) of a straight line, circle, and conics (ellipse, parabola and hyperbola) and their application in solving engineering problems..

**RECOMMENDED BOOKS**

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 RD Sharma
4. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar
5. Comprehensive Mathematics, Vol. I & II by Luxmi Publications
6. Engineering Mathematics by Dass Gupta
7. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
8. Engineering Mathematics, Vol I, II & III by V Sundaram et al, Vikas Publishing House (P) Ltd., New Delhi.
9. Engineering Mathematics by S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
10. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
11. Engineering Mathematics, Vol I & II by AK Gupta, MacMillan India Ltd., New Delhi
12. Applied Mathematics I, Archana Sharma, Lords Publications, Jalandhar
13. Advanced Engineering Mathematics by Peter V.Oneil, University of Alabama, 2007 edition, Cengage Learning India Pvt. Ltd. Patparganj, New Delhi

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**APPLIED PHYSICS – I (120103)**

**Credits- 04**

**L T P**

**4 0 0**

**Course 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.

**1. Units and Dimensions**

- 1.1 Physical quantities
- 1.2 Units - fundamental and derived units, systems of units (FPS, CGS, MKS and SI units)
- 1.3 Dimensions and dimensional formulae of physical quantities
- 1.4 Dimensional equations and principle of homogeneity, applications to conversion from one system of units to another, checking the correctness of physical relations and derivation of simple physical relations, limitations of dimensional analysis
- 1.5 Error in measurement, random and systematic errors
- 1.6 Application of units and dimensions in measuring length, diameter, Circumference, volume, surface area etc. of metallic and non metallic blocks, wires, pipes etc (at least two each).

**2. Force and Motion**

- 2.1 Scalar and vector quantities – examples, addition and multiplication (scalar product and vector product) of vectors
- 2.2 Force, resolution and composition of forces: resultant, parallelogram law of forces, equilibrium of forces
- 2.3 Newton's Laws of motion: concept of momentum, Newton's laws of motion and their engineering applications, derivation of force equation from Newton's second law of motion; conservation of momentum, impulse. Simple numerical problems
- 2.4 Circular motion: angular displacement, angular velocity and angular acceleration
- 2.5 Relation between linear and angular variables (velocity and acceleration)
- 2.6 Centripetal force (derivation) and centrifugal force with its application such as banking of roads, bending of cyclist, motion in vertical circle etc
- 2.7 Application of various forces in lifts, cranes, large steam engines and turbines,

**3. Waves and Vibrations**

- 3.1. Wave motion: transverse and longitudinal wave motion with examples,

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sound and light waves, velocity, frequency and wave length of a wave (relationship  $v = n\lambda$ ) and their applications

- 3.2 Wave equation,  $y = r \sin t$ , phase, phase difference, superposition of waves and their applications.
- 3.3 Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M.
- 3.4 Free, forced and resonant vibrations with examples
- 3.5 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications
- 3.6 Ultrasonics – production (magnetostriction and piezoelectric methods) and their engineering and medical applications

#### **4 Rotational Motion**

- 4.1 Concept of translatory and rotating motion with examples
- 4.2 Definitions of torque, angular momentum and their relationship
- 4.3 Conservation of angular momentum (qualitative) and its examples
- 4.4 Moment of inertia and its physical significance, radius of gyration, Theorems of parallel and perpendicular axes (statements), Moment of inertia of rod, disc, ring and sphere (Formulae only).
- 4.5 Application of rotational motions in transport vehicles, trains and aero plane turbine/engine.

#### **5 Work, Power and Energy**

- 5.1 Work: definition and its SI units
- 5.2 Work done in moving an object on horizontal and inclined plane (incorporating frictional forces) with its application
- 5.3 Power: definition and its SI units, calculation of power with numerical problems
- 5.4 Energy: Definition and its SI units: Kinetic energy and Potential energy with examples and their derivation
- 5.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another with its application
- 5.6 Friction: concept, types and its engineering applications.
- 5.7 Application of Friction in brake system of moving vehicles, trains, aero planes and other objects.

#### **6 Properties of Matter**

- 6.1 Elasticity: definition of stress and strain, different types of modulus of elasticity, stress – strain diagram, Hooke's law with its applications
- 6.2 Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, U-tube, manometers and barometer gauges and their applications
- 6.3 Surface tension: concept, its units, angle of contact, measurement of

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surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension

- 6.4 Fluid motion, stream line and turbulent flow, Equation of Continuity, Bernauli's Theorem and their applications.
- 6.5 Viscosity and coefficient of viscosity: Buoyant force, buoyancy, Stoke's Law and derivation of terminal velocity, effect of temperature on viscosity and its application in hydraulic systems.

## **7 Thermometry**

- 7.1 Difference between heat and temperature on the basis of K.E. of molecules
- 7.2 Principles of measurement of temperature and different scales of temperature and their relationship.
- 7.3 Resistance thermometers and Pyrometers with their field applications such as Thermocouple, Bi-metallic thermometer.
- 7.4 Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them
- 7.5 Modes of transfer of heat (Conduction, convection and radiation with examples)
- 7.6 Co-efficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle's method) and bad conductor (Lee's disc method)
- 7.7 Application of various systems of thermometry in refrigeration and air-conditioning etc.

## **RECOMMENDED BOOKS**

- 1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
- 2. Text Book of Physics for Class XII (Part-I, Part-II) N.C.E.R.T
- 3. Applied Physics Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, New Delhi
- 4. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
- 5. Fundamentals of Physics by Resnick and Halliday & Walker, Asian Book Pvt. Ltd., New Delhi
- 6. Berkeley Physics Course, Vol. I, II & III, Tata McGraw Hill, Delhi
- 7. The Feynman Lectures on Physics by Feynman, Leighton and Sands, Vol. I & II, Narosa Publishing House, Delhi
- 8. Comprehensive Practical Physics, Vol. I & II, JN Jaiswal, Laxmi Publishers
- 9. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
- 10. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
- 11. Applied Physics by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar City
- 12. Physics by Nelcon and Parker Publishers UK
- 13. Engineering Physics by Vanchna Singh and Sheetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi (year 2008)

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE: 25)**

**ENGLISH AND COMMUNICATION SKILLS - I (120104)**

**Credits- 03**

**L T P**

**3 0 0**

**Course 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.

**1. Facets of Literature**

1.2 Short Stories

- 1.1.1 Homecoming – R.N. Tagore
- 1.1.2 The Selfish Giant - Oscar Wilde
- 1.1.3 The Diamond Necklace- Guy- De Maupassant
- 1.1.4 The Stick – Justice Surinder Singh

1.2 Prose

- 1.2.1 I Have A Dream – Martin Luther King
- 1.2.2 On Habits – A. G. Gardiner
- 1.2.3 My struggle for An Education- Booker T Washington
- 1.2.4 Seeing People Off – Max Beerbohm

1.3 Poems

- 1.3.1 Ozymandias – P.B. Shelley
- 1.3.2 Daffodils – William Wordsworth
- 1.3.3 Stopping by Woods on a Snowy Evening – Robert Frost
- 1.3.4 Forefathers- Edmund Blunden

**2. Grammar and Usage**

2.1 Parts of speech

- 2.1.1 Nouns
- 2.1.2 Pronouns
- 2.1.3 Adjectives
- 2.1.4 Articles
- 2.1.5 Verbs
- 2.1.6 Adverbs
- 2.1.7 Prepositions
- 2.1.8 Conjunction
- 2.1.9 Interjection
- 2.1.10 Identifying parts of speech
- 2.1.11 Structures: Verb patterns, Question tags,
- 2.1.12 Subject – Verb agreement (concord)

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- 2.2 Pair of words (Words commonly confused and misused)
- 2.3 Tenses
- 2.4 Correction of incorrect sentences
- 2.5 One word substitution

**3. Translation**

- 3.1 Glossary of Administrative Terms (English and Hindi)
- 3.2 Translation from Hindi into English

**4. Paragraph of 100-150 words from outlines**

**5. Comprehension**

Unseen passages of literature, scientific data/graph based for comprehension exercises

**6. Communication**

- 6.1 Definition, Introduction and Process of Communication
- 6.2 Objectives of Communication
- 6.3 Notices

**RECOMMENDED BOOKS**

- 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
- 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 R Datta Roy and KK Dhir; Vishal Publication, Jalandhar

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**ENGINEERING DRAWING - I (123101)**

Credits- 05

L T P

2 0 6

**Course 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.

**Note:**

- i) First angle projection is to be followed
- ii) Minimum of 16 sheets to be prepared
- iii) Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students

**1. Introduction to Engineering Drawing**

1.1 Introduction to drawing instruments, materials and layout of drawing sheets.

**2. Free Hand Sketching and Lettering**

**(03 sheets)**

- 2.1 Different types of lines in Engineering drawing as per BIS specifications
- 2.2 Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments.
- 2.3. Free hand lettering (Alphabet and numerals) – lower case and upper case, single stroke, vertical and inclined at 75 degree in different standards, series of 3,5,8 and 12 mm heights in the ratio of 7:4

**3 Dimensioning Technique**

**(01 sheet)**

- 3.1 Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)
- 3.2 Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sink holes,



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counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches

**4. Scales (02 sheets)**

- 4.1 Scales - their need and importance (Theoretical instructions).
- 4.2 Drawing of plain and diagonal scales

**5. Projection (05 sheets)**

- 5.1 Theory of projections ( Elaborate theoretical instructions)
- 5.2 Projection of Points
  - 5.2.1. Production of a point in the first quadrant.
  - 5.2.2. Projection of a point in the third quadrant.
- 5.3 Projection of Straight Line
  - 5.3.1. Line parallel to both the planes
  - 5.3.2. Line perpendicular to any one of the reference plane
  - 5.3.3. Line inclined to any one of the reference plane.
- 5.4 Drawing 3 views of given objects( Non-symmetrical objects may be selected for this exercise)
- 5.5. Drawing 6 views of given objects( Non-symmetrical objects may be selected for this exercise)
- 5.6. Identification of surfaces on drawn views and objects drawn
- 5.7. Exercises on missing lines and views

Note: At least one sheet in third angle projection

**6. Sections (02 sheets)**

- 6.1 Importance and salient features, Methods of representing sections, conventional sections of various materials, classification of sections, conventions in sectioning
- 6.2 Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.
- 6.3 Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections
- 6.4 Exercises on sectional views of different objects.

**7. Isometric Views (03 sheets)**

- 7.1 Fundamentals of isometric projections (Theoretical instructions)
- 7.2 Isometric views of combination of regular solids like cylinder, cone, cube and prism.

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**RECOMMENDED BOOKS**

1. A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai & Co., Delhi
2. Engineering Drawing by PS Gill, SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt,  
Charotar Publishing House
4. Engineering Drawing I & II by JS Layall, Eagle Parkashan, Jalandhar

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**APPLIED CHEMISTRY - I LAB (120105)**

Credits- 01

L T P

0 0 2

**Note: Perform minimum ten practicals**

**LIST OF PRACTICALS**

1. Introduction to volumetric analysis, apparatus used in volumetric analysis and molarity based calculations.
2. Preparation of standard solution of oxalic acid  $\{(COOH)_2 \cdot 2H_2O\}$  or potassium permanganate ( $KMnO_4$ ) or potassium dichromate ( $K_2Cr_2O_7$ )
3. To verify the physical (state, colour, odour solubility, boiling and melting points) properties and few chemical properties of ionic (e.g. NaCl) and covalent (kerosene oil or any other such compound may be given) compounds.
4. To determine strength of given solution of sodium hydroxide by titrating against standard solution of oxalic acid using phenolphthalein indicator.
5. To determine total acid number of given oil volumetrically
6. To prepare cuprammonium  $\{Cu(NH_3)_4SO_4\}$  and estimate cupric ion in the given solution of copper sulphate solution by spectrophotometric method..
7. To distinguish between aldehyde and ketone by Tollen's reagent (benzaldehyde and acetone may be used)
8. To verify the first law of electrolysis. (Electrolysis of copper sulphate solution using copper electrode).
9. To prepare iodoform from ethanol or acetone
10. To prepare bakelite
11. To prepare the Mohr's salt from ferrous sulphate and ammonium sulphate.
12. Estimation of hardness of water by EDTA method.
13. Estimation of total alkalinity in the given sample of water by titrating against standard solution of sulfuric acid.
14. Determination of pH of given solution using pH meter.

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**APPLIED PHYSICS - I LAB (120106)**

**Credits- 01**

**L T P**

**0 0 2**

**Note: Perform minimum ten practicals**

**LIST OF PRACTICALS**

1. To find the diameter of wire using a screw gauge
2. To find volume of solid cylinder and hollow cylinder using a vernier calipers
3. To determine the thickness of glass strip and radius of curvature using a 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
11. To determine the viscosity of glycerin by Stoke's method
12. To determine the coefficient of linear expansion of a metal rod
13. To find the coefficient of thermal conductivity of Bakelite sheet (bad conductor) by Lee's Disc Method
14. To determine the coefficient of thermal conductivity of a copper strip using Searle's Thermal Conductivity apparatus.

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**ENGLISH AND COMMUNICATION SKILLS - I LAB (120107)**

**Credits- 01**

**L T P**

**0 0 2**

**LIST OF PRACTICALS**

1. Locating a Book in Library
2. To look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics
3. 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

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**GENERAL WORKSHOP PRACTICE - I (120108)**

**Credits- 03**

**L T P**

**0 0 6**

**Course 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.

The following shops are included in the syllabus:

1. Carpentry and Painting Shop-I
2. Fitting Shop –I
3. Welding Shop-I
4. Electric Shop –I
5. Smithy Shop –I or Electronic Shop-I
6. Sheet Metal Shop-I

**Note:**

1. The branches e.g. Civil Engineering, Electrical Engineering, Mechanical Engineering, Mechanical (RAC), Production and Industrial Engineering will do **Smithy Shop - I** instead of Electronic shop- I
2. The branches e.g. Electronics and Communication Engineering, ECE (Spl. in Microprocessor), Electronics and Telecommunication Engineering, Instrumentation and Control, Computer Engineering and Information Technology will do **Electronic shop-I** instead of Smithy Shop-I.
3. The branches e.g Computer Engineering and Information Technology will do **ONLY** Workshop Practice –I. The details are given in their respective curricula.
4. The instructor is to first explain the introductory part given at the beginning under each shop followed by demonstration and practice by students.

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**1. Carpentry and Painting Shop – I**

- 1.1 Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Hollack, Sheesham, Champ, etc. (Demonstration and their identification).
- 1.2 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.  
Job I Marking, sawing, planing and chiseling & their practice
- 1.3 Introduction to various types of wooden joints, their relative advantages and uses.  
Job II Preparation of half lap joint  
Job III Preparation of Mortise and Tenon Joint
- 1.4 Demonstration of various methods of painting wooden items.  
Job IV Preparation of surface before painting including primar coat Job  
V Painting Practice by brush/roller/spray

**2. Fitting Shop – I**

- 2.1 Introduction to fitting shop tools, common materials used in fitting shop, Identification of materials. (e.g. Steel, Brass, Copper, Aluminium etc.).Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.
- 2.2 Description and demonstration of various types of work benches holding devices and files. Precautions while filling.  
Job I Marking of job, use of marking tools and measuring instruments.  
Job II Filing a dimensioned rectangular or Square piece of an accuracy of 0.25mm  
Job III Filing practice (Production of flat surfaces) Checking by straight edge.
- 2.3 Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.  
Job IV Making a cutout from a square piece of MS Flat using Hand hacksaw.

**3. Welding Shop – I**

- 3.1 Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded, introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, Electrode holder, electrodes and their specifications, welding screens and other welding related equipment and accessories.
- 3.2 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 on electric arc welding for making uniform and

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Straight weld beads

- 3.3 Various types of joints and end preparation.  
Job III Preparation of butt joint by electric arc welding.  
Job IV Preparation of lap joint by electric arc welding.  
Job V Preparation of corner joint by using electric arc welding.  
Job VI Preparation of Tee joint by electric arc welding.

**4. Electric Shop – I**

- 4.1 Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, battens, cleats and allied items, tools and accessories.
- 4.2 Study of electrical safety measures and demonstration about use of protective devices.  
Job I Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin, plugs.  
Job II Preparation of a house wiring circuit using fuse, switches, socket, holder, ceiling rose etc. by batten wiring and PVC casing and capping.
- 4.3 Study of common electrical appliances such as electric iron, electric kettle, ceiling fan, table fan, electric mixer, electric Geyser, desert cooler etc.
- 4.4 Introduction to the construction of a Lead-acid battery and its working.  
Job III Installation of a battery and to connect two or more batteries in series and in parallel  
Job IV Charging of a battery and testing it with the help of hydrometer and Cell Tester

**5. Smithy Shop – I**

- 5.1 Demonstration and detailed explanation of tools and equipment used. Forging operations in Smithy shop. Safety measures to be observed in the smithy shop.
- 5.2 Demonstration and description of bending operation, upsetting operation, description and specification of anvils, swage blocks, hammers etc.
- 5.3 Demonstration and description of tongs, fullers, swages etc.
- Job I To forge a L-Hook.  
Job II To prepare a job involving upsetting process  
Job III To forge a chisel  
Job IV To prepare a cube from a M.S. round by forging method.

**OR**

**5. Electronic Shop - I**

- 5.1 Identification and familiarization with the following tools used in electronic shop:



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Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Sniper, Philips Screw Driver (Star Screw Driver), L- Keys, Soldering Iron and their demonstration and uses.

- 5.2 Identification and familiarization with the following electronic instruments: a) Multimeter analog and digital (Three and half digit)  
b) Single beam simple CRO, Signal Generator and Function Generator; function of every knob on the front panel  
c) Audio-oscillator having sine and square wave output  
d) Regulated Power supply -- fixed voltage and variable voltage, single output as well as dual output.  
Job I Practice in the use of above-mentioned equipment. For this small experimental as set up may be done
- 5.3 Various types of protective devices such as : Wire fuse, cartridge fuse etc.
- 5.4 Identification and familiarization with ear phone speaker connector, telephone jacks and similar male and female connectors
- 5.5 Safety precautions to be observed in the electronic shop

**NOTE:**

**Demonstration Boards for the above components should be made.**

Job II Cut, strip, join and insulate two lengths of wires/ cables (repeat with different types of cables/wires)

Job III Cut, strip, connect/solder/crimp different kinds of wires/ cables (including co-axial and shielded cable) to different types of power/general purpose/Audio Video/Telephone plugs, sockets, jacks, terminals, binding posts, terminal strips, connectors. The tasks should include making complete recording/ playback/ antenna/ speaker leads for common electronic products such as Radio, TV, CD Players, VCD/DVD Players, Cassette Recorder and Players, Hi-Fi equipment, Hand- set, microphone

Job IV-Cut, bend, tin component, Leads, inserts and solder components (resistor, capacitor, diodes, transistors, FETs, IFT coils, ICs etc) on a PCB

**6. Sheet Metal Shop –I**

Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material.

- 6.1 Introduction and demonstration of hand tools used in sheet metal shop.
- 6.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine, Turning Machine, Wiring Machine, Setting Down Machine, Forming Machine, Brake etc.

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- 6.3 Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheets etc.
- 6.4 Study of various types of Nuts, Bolts, Rivets, Steel Screws etc. Job  
I Shearing practice on a sheet using hand shears.
- a) Practice on making Single riveted lap joint/Double riveted lap Joint.
  - b) Practice on making Single cover plate chain type, zig-zag type and single rivetted Butt Joint.

**RECOMMENDED BOOKS**

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technoogy by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi

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**ENGLISH AND COMMUNICATION SKILLS - II (120201)**

**Credits- 04**

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**Course Objective:**

The curriculum aims to develop the use of English for three major purposes social interaction, academic achievement and professional use. Listening, speaking, reading, and writing skills can not be thought of as independent skills. They are generally perceived as interdependent where one skill often activates the other skills as well as the paralinguistic skills required for the achievement of effective communication. It is believed that the most effective way to achieve these purposes is through the adoption of a thematic, integrated, content-based approach to teaching and learning.

**1. LISTENING**

**Practical:**

- 1.2 Pre-recorded CDs of famous speeches and dialogues: Comprehension exercises based on the audio
- 1.3 Note-taking
- 1.4 Drawing inferences
- 1.5 Summarizing

**Note:** Teachers are expected to give necessary demonstrations, instructions and guidelines, while teaching above topics

**2. SPEAKING**

**Practical:**

- 2.1 Voice Modulation: Horizons (pitch, tone, volume, modulation)
- 2.2 Word stress, rhythm, weak and strong form, pauses, group-sense, falling and rising tones, fluency, pace of delivery, dealing with problem sounds, accent, influence of mother tongue etc.
- 2.3 Situational Conversation/role-playing with feedback, preferably through video recording
- 2.4 Telephonic Conversation: Types of calls, agreeing and disagreeing, making and changing appointments, reminding, making complaints and handling complaints, general etiquettes,
- 2.5 A small formal and informal speech
- 2.6 Seminar
- 2.7 Debate

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**Note:** Teachers are expected to give necessary demonstrations, instructions and guidelines, while teaching above topics

### **3. READING**

#### **Theory:**

3.1 Comprehension, Vocabulary enrichment and grammar exercises based on the following selective readings:

#### **Section-I**

- a. The Portrait of a Lady - Khushwant Singh
- b. The Lost Child by Mulk Raj Anand
- c. The Refugees – Pearl S. Buck

#### **Section-II**

- a. Life Sketch of Dr. Abdul Kalam
- b. Abraham Lincoln's letter to his son's Headmaster

#### **Section-III**

All The World's A Stage – W. Shakespeare  
Say Not, The Struggle Nought Availeth – A.H. Clough  
Pipa's Song – Robert Browning  
A Viewpoint – RP Chaddah  
Comprehension exercises on unseen passages

### **2.2 WRITING**

#### **Theory:**

- a. The Art of Précis Writing
- b. Correspondence: Business and Official
- c. Drafting
  - Report Writing: Progress report and Project report
  - Inspection Notes
  - Notices: Lost and found; Obituary; Auction Memos and Circulars
  - Notices, Agenda and Minutes of Meetings Use of internet and E-Mails
  - Press Release
  - Applying for a Job: Resume writing; forwarding letter and follow-up

2.6 Writing Telephonic messages

2.7 Filling-up different forms such as Banks and on-line forms for Placement etc.

**Note:** Teachers are expected to give practical examples, while teaching above topics

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**6.4 VOCABULARY AND GRAMMAR**

**Theory and Practical exercises on following:**

- a. Vocabulary of commonly used words
- b. Glossary of Administrative Terms (English and Hindi)
- c. One word substitution
- d. Idioms and Phrases
- e. Prefixes and Suffixes
- f. Punctuation
- g. Narration
- h. Forms of verbs: Regular and irregular

**12. EMPLOYABLE SKILLS**

**Theory:** Importance of developing employable and soft skills; List and tips for developing of employable skills

**Practicals:**

- a. Group discussions
- b. Presentations, using audio-visual aids (including power-point)
- c. Interview techniques: Telephonic interviews, Group interviews, face to face interviews
- d. Mannerism and etiquette etc.

**RECOMMENDED BOOKS**

1. Spoken English (2<sup>nd</sup> Edition) by V Sasikumar & PV Dhamija; Published by Tata MC Graw Hills, New Delhi.
2. Spoken English by MC Sreevalsan; Published by M/S Vikas Publishing House Pvt. Ltd; New Delhi.
3. Spoken English –A foundation course (Part-I & Part-II) By Kamlesh Sdanand & Susheela Punitha; Published by Orient BlackSwan, Hyderabad
4. Practical Course in English Pronunciation by J Sethi, Kamlesh Sadanand & DV Jindal; Published by PHI Learning Pvt. Ltd; New Delhi.
5. A Practical Course in Spoken English by JK Gangal; Published by PHI Learning Pvt. Ltd; New Delhi.
6. English Grammar, Composition and Usage by NK Aggarwal and FT Wood; Published by Macmillan Publishers India Ltd; New Delhi.
7. Business Correspondence & Report writing (4<sup>th</sup> Edition) by RC Sharma and Krishna Mohan; Published by Tata MC Graw Hills, New Delhi.
8. Business Communication by Urmila Rani & SM Rai; Published by Himalaya Publishing House, Mumbai.
9. Business Communication Skills by Varinder Kumar, Bodh Raj & NP Manocha; Published by Kalyani Publisher, New Delhi.
10. Professional Communication by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi. Business Communication and Personality Development by Bsiwajit Das and Ipseeta Satpathy; Published by Excel Books, Delhi
11. Succeeding Through Communication by Subhash Jagota; Published by Excel Books,

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Delhi

12. Communication Skills for professionals by Nira Konar; Published by PHI Learning Pvt. Ltd; New Delhi.
13. Developing Communication Skills (2<sup>nd</sup> Edition) by Krishna Mohan & Meera Banerji; Published by Macmillan Publishers India Ltd; New Delhi.
14. Effective Technical Communication By M .Ashraf Rizwi; Published by Tata MC Graw Hills, New Delhi.
15. Basic Communication Skills for Technology by Andrea J Rutherford; Published by Pearson Education, New Delhi
16. English & Communication Skills for students of Science & Engineering by SP Dhanavel; Published by Orient BlackSwan, Hyderabad.
17. Technical Communication- Principles & Practices by Meenakshi Raman & Sangeetha Sharma; Published by Oxford University Press, New Delhi.
18. Technical English by S. Devaki Reddy & Shreesh Chaudhary; Published by Macmillan Publishers India Ltd; New Delhi.
19. Advanced Technical Communication, by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
20. Communication Skills for Engineer & Scientist by Sangeeta Sharma & Binod Mishra; Published by PHI Learning Pvt. Ltd; New Delhi.

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**GURU GOBIND SINGH COLLEGE OF ENGINEERING & TECHNOLOGY**  
**DIPLOMA IN ELECTRICAL ENGINEERING (CODE: 25)**

**APPLIED MATHEMATICS - II (120202)**

Credits- 05

L T P

5 0 0

**Course 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.

**1. Algebra**

- 1.1 Determinants: Elementary properties of determinants up to 3<sup>rd</sup> order, consistency of equations, Cramer's rule.
- 1.2 Matrix: Algebra of matrices, Inverse of a matrix, matrix inverse method to solve a system of linear equations in 3 variables.
- 1.3 Application of Matrix in computer programming

**2. Differential Calculus**

- 2.1 Definition of function; Concept of limits.

$$\begin{array}{l} \text{Lt } \frac{x^n - a^n}{x - a} \\ \text{Four standard limits } x \end{array}$$

$$\begin{array}{l} \text{Lt } \frac{\sin x}{x} \\ \text{Lt } \frac{a^x - 1}{x} \\ \text{Lt } (1+x)^{1/x} \end{array}$$

- 2.2 Differentiation of  $x^n$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ,  $e^x$ ,  $\log_a x$  (Please take one example of differentiation by definition)
- 2.3 Differentiation of sum, product and quotient of functions. Differentiation of function of a function.
- 2.4 Differentiation of trigonometric inverse functions. Logarithmic differentiation. Exponential differentiation, Successive differentiation (excluding nth order).
- 2.5. Application of differential calculus in::
  - (a) Rate Measures
  - (b) Errors and increments
  - (c) Maxima and minima
  - (d) Equation of tangent and normal to a curve (for explicit functions only)

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**3. Integral**

- 3.1 Integration as inverse operation of differentiation with simple examples. Simple integration by substitution, by parts and by partial fractions (for linear factors only)
- 3.2 Evaluation of definite integrals (simple problems)-  
Evaluation of  $\int_0^{\pi/2} \text{Sin}^n x. dx$ ,  $\int_0^{\pi/2} \text{Cos}^n x dx$ ,  $\int_0^{\pi/2} \text{Sin}^m x \text{Cos}^n x dx$   
using formulae without proof (m and n being positive integers only)
- 3.4 Applications of integration for :  
(a) Simple problem on evaluation of area bounded by a curve and axes.  
(b) Calculation of volume of a solid formed by revolution of an area about axes. (Simple problems).  
(c) To calculate average and root mean square value of a function and  
(d) Area by Trapezoidal Rule and Simpson's Rule

**4. Statistics and Probability**

- 4.1 Measures of Central Tendency: Mean, Median, Mode with example of daily life.
- 4.2. Measures of Dispersion: Mean deviation, Standard deviation
- 2.8 Probability definition and addition law of probability, theorem and simple numerical problems, General view of normal probability curve (No numericals)
- 2.9 Explanation of different sampling techniques ( No numericals )

**5. Differential Equations**

- 5.1 Solution of first order and first degree differential equation by variable separation method (simple problems)
- 5.2. Differential equations of homogeneous equation

**RECOMMENDED BOOKS**

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. Engineering Mathematics, Vol I, II & III by V Sundaram et.al, Vikas Publishing House



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- (P) Ltd., New Delhi
- 5.4 Engineering Mathematics by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
- 5.5 Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
11. Engineering Mathematics, Vol I & II by AK Gupta, Macmillan India Ltd., New Delhi
- 5.8 Applied Mathematics-II, Archana Sharma, Lords Publications, Jalandhar
- 5.9 Advanced Engineering Mathematics by Peter V.O,neil, University of Albama 2007 edition, Cengage Learning India Pvt. Ltd. Patparganl, New Delhi.

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**APPLIED PHYSICS – II (120203)**

Credits- 04

L T P

4 0 0

**Course 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

**1. Optics**

- 7.4 Review of basic optics laws: Reflection and Refraction
- 7.5 Refractive index and magnification, image formation in lenses, lens formulae (thin lens only), power of lens, total internal reflection and their applications
- 7.6 Simple concepts of interference, diffraction, Polarization and their applications like Commercial equipment, optic glasses and its manufacturing and use of Polarimeter in sugarcane industry and distilleries (No explanation required).
- 7.7 Simple and compound microscope, astronomical telescope, magnifying power and its calculation (in each case) and their applications

**2. Electrostatics**

- 7.7 Coulombs law, unit charge and electric lines of force
- 7.8 Electric flux and Gauss's Law, Electric field intensity and electric potential
- 7.9 Electric field due to point charge, straight charged conductor, plane charged sheet and charged sphere (Inside and outside the sphere)
- 7.10 Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, Dielectric and its effect on capacitance, and dielectric break down  
Pollution, different types of pollution and polluting agents, Use of Electronics in reducing Air and Water pollution e.g. precipitation of microbes and moisture reparation from air and gases in industry (small explanation only)

**3. DC Circuits**

- 3.1 Concept of electricity, various applications of electricity
- 3.2 Current, voltage, resistance, potential difference and e.m.f, power, electrical energy and their units, advantages of electrical energy over other forms of energy and Alternating Current and Direct Current
- 3.3 Ohm's law and its applications, specific resistance, effect of temperature on resistance, co-efficient of resistance, series and parallel combination of resistors

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- an Resistance, Definitions of Conductance and Super Conductor's
- 3.4 Kirchhoff's laws, Wheatstone bridge principle and its applications
- 3.5 Heating effect of current and concept of electric power, energy and their units, related numerical problems and their applications
- 3.6 Examples of DC Circuits e.g. Various electrical and electronic equipment CRO, T.V., Audio system, Computers (Only examples, no explanations)

**4. Electromagnetism**

- 4.1 Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units
- 4.2 Permeability and susceptibility and their applications. Electromagnetic Induction, Lanz's law and its uses like dynomo, Right hand and left hand rules, Magnetic lines of force due to straight conductor, Solenoid and Circular coil. Force on a current carrying rectangular coil placed in magnetic field and its uses in moving coil galvanometer, electric motor (Concept only). Lorentz force, Force on a current carrying conductor (straight and rectangular)
- 4.3 Moving coil galvanometer its principle, construction and working.

**5. Semiconductor physics**

- 5.1 Energy bands, intrinsic and extrinsic semiconductors, p-n junction diode and its characteristics
- 5.2 Diode as rectifier – half wave and full wave rectifier, semiconductor transistor pnp and npn (concept only)

**6. Modern Physics**

- 6.1 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 their engineering and medical applications
- 6.2 Fibre optics: introduction to optical fiber materials, types, light propagation and applications in communication.

**RECOMMENDED BOOKS**

- 1. Text Book of Physics for Class XI (Part-I, Part-II) N.C.E.R.T
- 2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
- 3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
- 4. Fundamentals of Physics by Resnick, Halliday and Walker, Asian Book Pvt. Ltd., New Delhi
- 5. Fundamentals of Optics by Francis A. Jenkins & Harvey E White, McGraw Hill International Editions, Physics Series
- 6. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi

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7. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publishers
8. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
9. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar
10. Applied Physics Vol II by Jasmer Kaur and Bhupinder Singh, Lords Publications, Jalandhar
11. Basic Electronics and Linear Circuits by NN Bhargava et al Tata Mc Graw Hill Publishers, New Delhi
12. Principles of Electronics by SK Sahdev, Dhanpat Rai and Co, New Delhi
13. Engineering Physics by Vanchna Singh and Sheetal Kumar, Cengage Learning India Pvt. Ltd. Patparganj, Delhi (year 2008)

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE: 25)**

**APPLIED CHEMISTRY - II (120204 )**

**Credits- 04**

**L T P**

**4 0 0**

**Course 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 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 apply applied aspects of chemistry. In order to educate and train Engineers and skilled work force applied chemistry syllabus for diploma students in various engineering and technology courses is designed to develop scientific temper and appreciate physical and chemical properties of engineering materials, which are used in their professional career. Best efforts should be made to teach and train the skilled engineers and work force by imparting essential knowledge required from this subject through demonstrations, and minor projects.

**1. Metallurgy**

- 2.4 General metallurgical terms/operations
- 2.5 Free energy change( $\Delta G$ ) criteria in metallurgical operation – Ellingham diagram – oxides, usefulness and limitations
- 2.6 Extraction of pure iron, copper and aluminium from their chief ores
- 2.7 Manufacture of wrought iron, steel by open hearth process and L.D. process
- 2.8 Alloys- types of alloys (ferrous and non ferrous) purposes of alloying, composition, properties and applications of – invar steel, nichrome, stain less steel, alnico, germen silver, brass, bronze, gun metal, duralumin, magnalium and solder
- 2.9 Definition, classification, composition, advantages and industrial applications of composites materials.

**2. Corrosion**

- 2.10 Definition of corrosion, erosion and distinctions, cause of corrosion, types of corrosion – dry and wet corrosion
- 2.11 Theories of corrosion- Pilling Bedworth rule of dry corrosion, electrochemical theory of corrosion-  $H_2$  evolution,  $O_2$  absorption, definition of passivation, galvanic series

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- 2.12 Other forms of corrosion – high temperature corrosion, stress corrosion, caustic embrittlement, filiform corrosion
- 2.13 Factors influencing rate of corrosion
- 2.14 Preventions and control measures:
  - Internal measures- purification of metals, alloying with corrosion resistant elements, heat treatment
  - External measures –
    - Modification of corrosion environments, Application of anodic, cathodic and organic inhibitors,
    - b) Protective coatings – (a) Metallic coatings (b) Non-metallic coating (c) Sacrificial anode
- 2.5.3 Prevention of corrosion by material selection and design
- 2.6 Application of corrosion protection and erosion protection in boilers, fluid flow, industries and commercial organizations.

### **3. Fuels**

- 3.1 Definition of fuel, combustion, classification of fuels, characteristics of good fuel, merits and demerits of gaseous fuels over solid and liquid fuels
- 3.2 Calorific value, - HCV, LCV and relation between both, determination of calorific value by Bomb calorimeter, and Dulong's formula (equation to be assumed, numerical problems)
- 3.3 Coal and proximate analysis of coal, Bergius process of converting coal into gasoline, power alcohol – advantages and disadvantages
- 3.4 Fuel rating: octane and cetane numbers, influence of chemical composition and structure on fuel quality
- 3.5 Gaseous fuels: chemical composition usefulness and limitations of Natural gas, CNG, producer gas, water gas and carbureted water gas, coal gas, oil gas LPG, and biogas (manufacturing details are excluded)
- 3.9 Future fuels –Hydrogen, CNG + propane, LNG.
- 3.10 Numerical problems on 3.2 and 3.3 sections only.
- 3.11 Advantages and limitations of flue gases in industries
- 3.12 Energy Conservation programmes.

### **4. Lubricants**

- 4.1 Definition of lubricants and lubrication
- 4.2 Functions of lubricant
- 4.3 Mechanism of lubrication- hydrodynamic and thin film lubrication
- 4.4 Classification of lubricants
  - 4.4.1 Lubricating oils,
  - 4.4.2 Greases
  - 4.4.3 Solid lubricants
- 4.5 Properties of lubricants
  - Physical properties- viscosity and viscosity index, flash point and fire

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point, cloud and pour point, oiliness, volatility, colour, emulsification  
Chemical properties- total acidity number (TAN), soapanification value,  
iodine value, aniline point, precipitation number, coke number

- 4.6 Application of various lubricating oils, greases, solid lubricants in automobile, mechanical and chemical industry.

**5. Engineering materials and Refractories**

- 5.1 Superconductors- Types, properties of and applications of superconductors  
Types-I -Al, In and Pb and Type –II Nb-Zr alloy
- 5.2 Introduction and characteristics of good refractory materials Types and chemical composition of acidic, basic and neutral refractories Applications of refractories
- 5.3 Glass – chemical composition, types of glasses and their applications
- 5.4 Constituent of paints, characteristics of good paint Constituent and characteristics of varnishes Constituent of enamels Uses of paints varnishes and enamels
- 5.5 Applications
- 5.5.1 Application of Geo synthetic and ceramic materials in industry, road and dam construction and high rise building construction.
- 5.5.2 Application of Marine paints in ships, submarines and Navy equipments.

**6. Polymers, Plastics and Adhesives.**

- 6.1 Polymerization, degree of polymerization (DP). Addition and condensation polymers with suitable examples
- 6.2 Definition, structure and applications of thermoplastics{PE (HDP, LDP), PVC, Polystyrene} and thermosetting (Buna-S, Nylon-6, Nylon-66, Nylon- 10, Bakelite, teflon) plastics with examples of each type
- 6.3 Additive for plastics - Plasticizer, fillers, cross linking agents, blowing agents colourants, stabilizers and binders
- 6.4 Definition and examples of fibers and elastomers (natural and synthetic rubber) gutta percha,
- 6.5 Adhesives, synthetic resins (both thermosetting and thermoplastic)
- 6.6 Chemical factors influencing adhesive action (polarity, DP, branching of chain and pH)
- 6.7 Applications
- 6.7.1 Application of Polymers, plastics and adhesives in automobile, mechanical, chemical, textile and construction industries.
- 6.7.2 Application of plastics as packaging material in food, dairy, confectionary products. Application of synthetic resins in plywood, wood furniture, house windows & doors and building decorative

**7. Environmental Pollution and its control.**

- 7.1 Introduction
- 7.2 Causes and control of air, water, and soil pollutions

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- 7.3 Noise pollution
- 7.4 Radio active pollution and its control
- 7.5 Sewage and its treatment
- 7.6 Chemical analysis and treatment of industrial effluent

**RECOMMENDED BOOKS**

1. Chemistry in Engineering by J.C. Kuricose and J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C.Jain and Monika Jain, Dhanapat Rai Publishing Company New Delhi.
3. Engineering Chemistry by Shashi Chawla.
4. Progressive Applied Chemistry – II by Dr. G.H. Hugar, Eagle Prakashan Jalandhar.
5. Engineering Chemistry – A text Book by H. K. Chopra and A Parmer- Narosa Publishing House New Delhi.
6. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, a unit of Krishna Prakashan Pvt. Ltd. Meerut, India, (year 2008)
7. Rapid Chemistry for peak performance by Anil Ahlawat, MTE books, 503, Taj Apartments, Ring Road, New Delhi (year 2008)
8. Applied Chemistry (Theory and Practice) by Vermani OP and Narula A.K., Cengage International Pvt. Ltd. New Delhi (year 2008)
9. Engineering Chemistry by Shelli Oberoi and Monica Malik, Cengage International Pvt. Ltd. New Delhi (year 2008)



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**ENGLISH AND COMMUNICATION SKILLS –I LAB (120205)**

**Credits- 01**

**L T P**

**0 0 2**

**List of Practical's**

**3. LISTENING**

- ✓ Using pre-recorded CDs/DVDs with pre-listening exercise to prepare students about what they are going to hear and comprehension based on the audio
- ✓ Note-taking
- ✓ Listening for the main ideas
- ✓ Assessing listening proficiency

**4. SPEAKING**

- ✓ Exercises on pronunciation of common words as given in the standard dictionary using symbols of phonetics
- ✓ Greetings for different occasions
- ✓ Introducing oneself, others and leave taking(talking about yourself)
- ✓ Just a minute (JAM) sessions: Speaking extempore for one minute on given topics
- ✓ Paper reading before an audience (reading unseen passages)
- ✓ Situational Conversation/role-playing with feedback, preferably through video recording
- ✓ Reading aloud of Newspaper headlines and important articles
- ✓ Improving pronunciation through tongue twisters

**5. READING**

- ✓ Paper reading
- ✓ Poetry recitation
- ✓ Reading newspaper headlines

**6. WRITING**

- ✓ Exercises on spellings
- ✓ Group exercises on writing paragraphs on given topics

**7. VOCABULARY**

- ✓ To look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics
- ✓ To seek information from an Encyclopedia

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE: 25)**

**APPLIED PHYSICS - II LAB (120206)**

**Credits- 01**

**L T P**

**0 0 2**

**LIST OF PRACTICALS**

1. To find the focal length of convex lens by displacement method.
2. To determine the magnifying power of an astronomical telescope
3. To verify ohm's laws by drawing a graph between voltage and current.
4. To verify laws of resistances in series and in parallel connection.
5. To find resistance of galvanometer by half deflection method
6. To measure very low resistance and very high resistance using Wheat Stone bridge
7. To determine the capacity of a parallel plate capacitor by discharging through a voltmeter and also find out the time constant of the given capacitor.
8. To draw characteristics of a pn junction diode and determine knee and break down voltages
9. To find wave length of He Ne semiconductor LASER.
10. Use of CRO in plotting AC/DC

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**APPLIED CHEMISTRY – II LAB (120207)**

**Credits- 01**

**L T P**

**0 0 2**

**LIST OF PRACTICALS**

**Note:** Experiments at sr. no 1 to 11 are to be performed compulsorily and maintain laboratory manual, in addition every student will compulsorily submit a separate hand written inventory report on any four topics among the list at no. 12.1 to 12.7 at the end of session.

1. Estimation of copper in the given copper ore solution volumetrically or spectro-photometrically.
2. Estimation of moisture and ash in the given coal sample gravimetrically
3. Determination of viscosity of given liquid by Red Wood viscometer
4. Determination of flash / fire point of the given lubricant using Able' s flash point apparatus
5. To study the effect of metal coupling on corrosion of iron.
6. Study of the role of emulsifying agents in stabilizing the emulsion of different oils.
7. Volumetric estimation of total acid value (Total acid number TAN) of a lubricating oil
8. Determination of molecular mass of polystyrene (high polyester) by viscometry.
9. Study of effect of acids and bases on tensile strength of natural (use cotton, wool, and silk) and synthetic polymer fibres.
10. Application of  $\text{FeCl}_3$  in etching process for PCB
11. To construct Daniel cell and measure its e.m.f. using voltmeter.
12. A compulsory hand written inventory report need to be submitted by the students for any four

determination of viscosity of given lubricant,  
total acid number (TAN) of a lubricating oil,  
metal ions present in the water,  
estimation of hardness of water collected from different water sources  
estimation of chloride and alkalinity of water collected from different water sources  
Collecting technical data on lubricating oils, edible oils etc  
Ores of different metals and non metals available in India along with chemical composition and locating the places on self drawn India's map  
Collection and presentation of statistical data on water quality of your district/  
state / country

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE: 25)**

**BASICS OF INFORMATION TECHNOLOGY (121202)**

Credits- 02

L T P

0 0 4

**Course Objective:**

Information technology has great influence on all aspects of life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools of MS office; using internet etc. form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

**Note:**

**Explanation of Introductory part should be dovetailed with practical work. Following topics may be explained in the laboratory along with the practical exercises. There will not be any theory examination.**

***TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION***

1. Information Technology – its concept and scope, applications of IT, impact of computer and IT in society.
2. Computers for information storage, information seeking, information processing and information transmission
3. Computer Application in office, book publishing, data analysis, accounting, investment, inventory control, graphics, Air and Railway Ticket reservation, robotics, Military, banks, Insurance financial transactions and many more
4. Elements of computer system, computer hardware and software; data types – numeric data, alpha numeric data; contents of a program, processing
5. Computer organization, block diagram of a computer, CPU, memory
6. Input devices; keyboard, Scanner, mouse etc; output devices; VDU and Printer, Plotter
7. Electrical requirements, inter-connections between units, connectors and cables
8. Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD), primary and secondary memory: RAM, ROM, PROM etc., Capacity; device controllers, serial port, parallel port, system bus
9. Installation concept and precautions to be observed while installing the system and software

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10. Introduction about Operating Systems such as MS DOS, Windows, Windows NT etc. as an interface to Computer System
11. Special features, various commands of MS word and MS-Excel, MS PowerPoint
12. About the internet – server types, connectivity (TCP/IP, shell); applications of internet like: e-mail and browsing
13. Various Browsers like Internet explorer, Mozilla Fire fox, WWW (World wide web); hyperlinks; HTTP (Hyper Text Transfer Protocol); FTP (File Transfer Protocol)
14. Basics of Networking – LAN, WAN, Topologies
15. Ethics and information Technology
16. Future with information Technology

***LIST OF PRACTICALS***

1. *Given a PC, name its various components and peripherals. List their functions*
2. Practice in installing a computer system by giving connection and loading the system software and application software
3. Exercises on entering text and data (Typing Practice)
4. Installation of operating System viz. Windows XP, Windows 2007 etc.  
Features of Windows as an operating system
  - a. Start
  - b. Shutdown and restore
  - c. Creating and operating on the icons
  - d. Opening closing and sizing the windows
  - e. Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
  - f. Creating and operating on a folder
  - g. Changing setting like, date, time, colour (back ground and fore ground)
  - h. Using short cuts
  - i. Using on line help
- 2 MS-Word
  - a. File Management:
  - b. Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, Giving password protection for a file
  - c. Page Set up:
  - d. Setting margins, tab setting, ruler, indenting
  - e. Editing a document:
  - f. Entering text, Cut, copy, paste using tool- bars

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- g. Formatting a document:
  - h. 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
  - i. Aligning of text in a document, justification of document, Inserting bullets and numbering
  - j. Formatting paragraph, inserting page breaks and column breaks, line spacing
  - k. Use of headers, footers: Inserting footnote, end note, use of comments
  - l. Inserting date, time, special symbols, importing graphic images, drawing tools
  - m. Tables and Borders:
  - n. 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
  - o. Print preview, zoom, page set up, printing options
  - p. Using Find, Replace options
  - q. Using Tools like:
  - r. Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelopes and labels
  - s. Using shapes and drawing toolbar,
  - t. Working with more than one window in MS Word,
  - u. How to change the version of the document from one window OS to another
  - v. Conversion between different text editors, software and MS word
5. MS-Excel
- a. Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets
  - b. Menu commands:
    - i. Create, format charts, organise, manage data, solving problem by analyzing data, exchange with other applications. Programming with MS-Excel, getting information while working
  - c. Work books:
    - i. 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
  - d. Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet
  - e. Creating a chart:

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE: 25)**

- i. Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
  - f. Using a list to organize data, sorting and filtering data in list
  - g. Retrieve data with query: Create a pivot table, customising a pivot table. Statistical analysis of data
  - h. Exchange data with other application: embedding objects, linking to other applications, import, export document.
- 6.5 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
  - c) Insertion of multimedia elements
    - Adding text boxes
    - Adding/importing pictures
    - Adding movies and sound
    - Adding tables and charts etc.
    - Adding organizational chart
- Formatting slides
- Using slide master
  - Text formatting
  - Changing slide layout
  - Changing slide colour scheme
  - Changing background
  - Applying design template
- How to view the slide show?
- Viewing the presentation using slide navigator
  - Slide transition
  - Animation effects etc.
8. Working with MS Access
- a) Understanding different data types
  - b) Creation of table

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- c) Entering data in a table and modify it.
  - d) Creating simple Queries
9. 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**

- 2 Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
- 3 Information Technology for Management by Henery Lucas, 7<sup>th</sup> edition, Tata Mc Graw Hills, New Delhi
- 4 Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
- 5 Computers Today by SK Basandara, Galgotia publication Pvt ltd. Daryaganj, New Delhi.
- 6 MS-Office 2000 for Everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., New Delhi
- 7 Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
- 8 A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
- 9 Mastering Windows 95, BPB Publication, New Delhi
- 10 Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
- 11 Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
- 12 On Your Marks - Net...Set...Go... Surviving in an e-world by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
- 13 Learning MS Office XP by Ramesh Bangia, Khanna Book Publishing Co. (P) Ltd., New Delhi.
- 14 Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar



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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE: 25)**

**ENGINEERING DRAWING - II (123201)**

**Credits- 05**

**L T P**

**2 0 6**

**Course 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.

**Note:**

- 1) First angle projection is to be followed
- 2) Minimum 15 sheets to be prepared
- 3) BIS Code SP 46 -1988 should be followed
- 4) Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students
- 5) 20 percent of drawing sheets to be prepared on the third angle projection
- 6) Punjab State Board of Technical Education, may recommend any of the CAD software viz. Solid Works, Pro Engineer, CATIA, NX, Inventor-AutoCAD etc.
- 7) The State Directorate of Technical Education may allocate funds for the purchase of computer systems and CAD software for drawing classes.
- 8) Continuous evaluation be done by the teachers for exercises/work done on CAD software. For this proper record may be maintained for its inclusion in the internal assessment.

**1. Detail and Assembly Drawing**

4. Principle and utility of detail and assembly drawings
5. Introduction to CAD Software
6. Practical exercise on drawing from detail to assembly or vice versa using wooden joints as example with CAD Software

**2. Threads**

**(Min.02 sheets)**

- 2.1 Nomenclature of threads, types of threads (metric). Single and multiple start threads
- 2.2 Forms of various external thread sections such as V, Square, Acme, Knuckle, Metric, Seller and Buttress thread
- 2.3 Simplified conventions of left hand and right hand threads, both external and internal threads
- 2.4 Draw at least one sheet using CAD Software

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- 3. Nuts and Bolts (Min.02 sheets)**
- 3.1 Different views of hexagonal and square headed bolts and nuts
  - 3.2 Assembly of nuts and bolts with washers
  - 3.3 Draw at least one sheet using CAD Software
- 4. Locking Devices (01 sheet)**
- 4.1 Lock nuts, Castle nuts, Sawn nuts, Split pin lock nut
  - 4.2 Spring washers, Locking plates.
  - 4.3 Draw different locking devices using CAD Software
- 5. Screws, Studs and Washers (01 sheet)**
- 5.1 Drawing various types of machine screws
  - 5.2 Drawing various types of studs
  - 5.3 Drawing various types of washers
  - 5.4 Redraw the above sheet using CAD Software
- 6. Keys and Cotters (Min.03 sheets)**
- 6.1 Various types of keys and their application. Preparation of drawings of various keys and cotters
  - 6. Various types of joints (a) Sleeve and Cotter joint (b) Kunckle joint (c) Spigot and Socket joint
  - 7. Draw any one joint using CAD Software
- 7. Rivets and Rivetted Joints (02 sheets)**
- 7.1 Types of general purpose rivet heads
  - 7.2 Types of rivetted joints - lap, butt (single cover plate and double cover plate), chain and zig-zag riveting.
  - 7.3 Caulking and fullering of rivetted joints.
  - 7.4 Draw any one type of rivetted joint using CAD Software

**RECOMMENDED BOOKS**

- 1. A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai & Co., New Delhi
- 2. Engineering Drawing by PS Gill, SK Kataria & Sons, New Delhi
- 3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt, Charotar Publishing House
- 4. Engineering Drawing I & II by JS Layall, Eagle Parkashan, Jalandhar

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5. AutoCAD 2010: For Engineers & Designers by Prof. Sham Tickoo & D. Sarvanan, Wiley India Pvt. Ltd., Delhi
6. CATIA for Beginners by Prof. Sham Tickoo, Wiley India Pvt. Ltd., Delhi
7. CATIA for Engineers and Designers by Prof. Sham Tickoo, Wiley India Pvt. Ltd., Delhi
8. Pro/Engineer Wildfire 5.0 for Engineers and Designers by Prof. Sham Tickoo, Wiley India Pvt. Ltd., Delhi.
9. NX 6: For Engineers and Designers by Prof. Sham Tickoo, Wiley India Pvt. Ltd., Delhi.
10. Solidworks 2009: The Basics by David C. Planchard, Schroff Development Corporation, Post Box 1334, Mission KS 66222, USA.
11. Solidworks 2010 for Engineers and Designers, Prof. Sham Tickoo, Wiley India Pvt. Ltd, Delhi

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE: 25)**

**GENERAL WORKSHOP PRACTICE - II (120208)**

Credits- 03

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**Course 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.

The following shops are included in the syllabus. Student can opt relevant shops depending upon the need of his/her branch of diploma programme :

- Carpentry and painting shop-II
- Fitting shop -II
- Welding shop -II
- Electric shop -II
- Smithy shop –II or Electronic shop-II
- 6. Sheet Metal Shop –II

**Note:**

1. The branches e.g. Civil Engineering, Electrical Engineering, Mechanical Engineering, Mechanical (RAC), Production and Industrial Engineering will do **Smithy Shop -II** instead of Electronic shop- II
- and**
2. The branches e.g. Electronics and Communication Engineering, Electronics (with Specialization in Microprocessor), will do **Electronic shop- II** instead of Smithy Shop-II
3. The instructor is to first explain the introductory part given at the beginning under each shop followed by demonstration and practice by students.

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

- 1.1 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 atleast one utility job with and without lamination.
- 1.2 Demonstration of job showing use of Rip Saw, Bow saw and Tenon saw, method

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of sharpening various saws.

- 1.3 Demonstration of job on Band Saw and Circular Saw, Chain and Chisel, Universal wood working machine, Saw re-sharpening machine, Saw Brazing unit.
- 1.4 Importance and need of polishing wooden items, Introduction to polishing materials.  
Job V Preparation of surface before polishing including prime coat.  
Job VI Polishing on wooden items.

**2 Fitting Shop – II**

- 2.1 Introduction to various types of threads (internal, external)-single start, multi-start, left hand and right hand threads.
- 2.2 Description and demonstration of various types of drills, taps and dies Selection of dyes for threading, selection of drills and taps for tapping operations.  
Job I Making internal and external threads on a job by tapping and dieing operations (manually)
- 2.3 Precautions while drilling soft metals, e.g. Copper, Brass, Aluminium etc. Job II Drilling practice on soft metals (Aluminum, Brass and Copper)
- 2.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier calipers, micrometer, height gauge, combination set. Handling of measuring instruments, checking of zero error, finding of least count.  
Job III Preparation of a job by filing on non-ferrous metal up to an accuracy of 0.1mm  
Job IV Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow, tee, union, socket, stopcock, taps, etc

**3. Welding Shop – II**

- 3.1 Introduction to gas welding, spot welding and seam welding and machinery and equipment used. Adjustments of different types of flames in gas welding, demonstration and precautions about handling welding equipment.  
Job I Practice in handling gas welding equipment (Low pressure and High pressure) and welding practice on simple jobs.
- 3.2 Common welding joints generally made by gas welding.  
Job II Preparation Butt joint by gas welding.  
Job III Preparation of small cot frame from conduit pipe by electric arc welding/gas welding.  
Job IV Preparation of square pyramid from MS rods by welding (type of welding to be decided by students themselves).  
Job V Exercise of preparing a job on spot/seam welding machine.

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**4 Electric Shop – II**

4.1 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.

1.1 Estimating and costing of power connection.

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 series lamp) 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 a table fan/ceiling fan/air cooler/mixer/electric iron, Electric heater, geyser, electric oven, air conditioner etc.

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

Job V Testing Single phase/three phase electrical motor by using voltmeters, ammeter, clip on meter, tachometer etc.

Job VI Reversing the rotation of a motor.

**5. Smithy Shop – II**

5.1 Introduction to various heat treatment processes e.g annealing, hardening, tempering, normalizing etc.

5.2 Description of various types of power hammers and their usage (Demonstration only).

Job I To forge a ring to acquaint the students with forge welding

Job II To forge a chisel and acquaint the students with simple idea of hardening and tempering .

Job III To forge squares on both ends of a circular rod

Job IV To forge a single/double ended spanner.

Job V To prepare a job involving drawing down process

**OR**

**6.2 Electronic Shop- II**

Demonstrate the jointing methods. mounting and dismantling as well as uses of the items mentioned below:

Various types of single, multi-cored insulated screened power, audio video,

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co-axial, general purpose wires/cables

Various types of plugs, sockets connectors suitable for general purpose audio and video use, 2 and 3 pin mains plug and sockets.

Banana-plugs, and sockets, BNG, RCA, DIN, UHF, Ear phone speaker connector, telephone jacks and similar male and female connectors and terminal strips.

- c) Various types of switches such as: normal/ miniature toggle, slide, push button, piano key, rotary, micro switches, SPST, SPDT, DPST, DPDT, band selector, multi way Master Mains Switch.
- d) Various types of protective devices such as : Wire fuse, cartridge fuse, slow acting/fast acting fuse, HRC fuse, thermal fuse, single/multiple circuit breakers, over and under current relays.

6.3 Identification and familiarisation with active and passive components; colour code and types of resistor, capacitors and potentiometers (including VDR, LDR, and thermistor). Identification of components including LED, LCD, UJT, FET, Coils, relays, switches (SPDT, DPDT, etc.) connectors, micro switches, read relays, transformers (mains, audio and RF, etc) Linear and Digital ICs, Thyristors, etc.

**6.3 Demonstrate the following:**

- 1) To make perfect solder joints and soldering on PCBs
- 2) To remove components/wires by unsoldering.
- 3) To assemble components on boards, chassis, tape strips.
- 4) Various laying methods of cables
- 5) Exposure to modern soldering and de-soldering processes
- 6) Field visits to relevant work-places

Job I De-solder, remove and clean all the components, wires from a given equipment, a PCB or a tap strip using the following:

Job II Soldering Iron

Job III Temperature Control Soldering Iron

Job IV De-soldering Pump

Job V De-soldering Strip

Job VI Wiring of a small circuit on a PCB/tag strip involving lacking, sleeving and use of identifier tags

**6. Sheet Metal Shop-II**

6.1 Introduction to various metal forming processes e.g. Spinning, Punching,

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Blanking, cup drawing

6.2 Introduction to soldering and brazing.

6.3 Introduction to metal spinning process.

Job I Preparation of job involving shearing, circular shearing, rolling, folding, beading and soldering process e.g. Funnel or any other job involving above operations.

Job II Exercise on job involving brazing process

Job III Spinning a bowl/cup/saucer

Job IV Visit to a sheet metal industry e.g. coach builders etc.

**RECOMMENDED BOOKS**

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Choudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technoogy by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delh



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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE: 25)**

**FUNDAMENTALS OF ELECTRICAL ENGINEERING (125301)**

**Credits- 04**

**L T P**

**4 0 0**

**Course 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.

**1. (a) Application and Advantages of Electrical Energy**

Different forms of energy, Advantages of electrical energy, Uses of electrical energy

**1.6 Basic Electrical Quantities**

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

**2. DC Circuits**

2.8 Ohm's law, resistances in series and parallel

2.9 Kirchhoff's laws and their applications in solving electrical network problems

2.10 Network theorems such as Thevenin's theorem, superposition theorem Maximum power and transfer theorem and Norton's theorem

2.11 Star-delta transformation

**3. Batteries**

8. Basic idea about primary and secondary cells

9. Working principle, construction and applications of Lead acid, Nickel Cadmium and Silver Oxide Cells

10. Charging methods used for lead acid accumulator

11. Care and maintenance of a lead acid battery

12. Grouping of cells in series and parallel (simple numerical problems).

**4. Magnetism and Electromagnetism:**

3.2 Introduction to electromagnetism, Magnetic field around a straight current carrying conductor and a solenoid and methods to find its direction, force between two parallel

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current carrying conductors.

- 3.3 Force on a conductor placed in the magnetic field
- 3.4 Series magnetic circuits, simple problems
- 3.5 Concept of hysteresis, loop and hysteresis loss.

**5. Electromagnetic Induction:**

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

**6. AC Fundamentals**

- 6.1. Concept of a.c. generation (single phase and three phase)
- 6.2. Difference between a.c and d.c
- 6.3. Concept of alternating current and voltage, equation of instantaneous values, average value, r.m.s value, form factor, power factor etc.
- 6.4. Concept of phasor and phase difference.
- 6.5. Representation of alternating sinusoidal quantities by vectors
- 6.6. Phasor algebra (addition, subtraction, multiplication and division of complex quantities)

**7. AC Circuits**

- 2.3 AC through pure resistance, inductance and capacitance
- 7.2. Alternating voltage applied to RL, RC and RLC series and parallel circuits (impedance triangle, phasor diagram and their solutions)
- 7.3. Concept of susceptance, conductance and admittance
- 7.4. J-notation and its application in solving problems in ac circuits
- 7.5. Power in pure resistance, inductance, capacitance, RL, RC, RLC circuits
- 7.6. Active and reactive components of current and their significance
- 7.7. Power factor and its practical significance
- 7.8. Resonance in series and parallel circuits

**8. Poly-Phase systems**

- 8.1 Advantages of 3 phase over single phase system

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- 8.2 Star and delta connections (relationship between phase and line voltages, phase and line currents)
- 8.3 Power in 3 phase circuits and measurement by one wattmeter method
- 8.4 Measurement of power and power factor of a 3-phase load by two wattmeter method using balanced/unbalanced load.

**RECOMMENDED BOOKS**

- 1. Fundamentals of Electrical Engineering by Sahdev, Uneek Publication, Jalandhar
- 2. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill Education Pvt. Ltd., New Delhi
- 3. Electrical Science by VK Mehta, S Chand and Co., New Delhi
- 4. Electrical Engineering by DR Arora, Ishan Publications, Ambala
- 5. Electrical Technology by JB Gupta, SK Kataria and Sons, New Delhi
- 6. Electrical Technology by BL Theraja, S Chand & Co., New Delhi
- 7. Electrical Science by S. Chandhni, R Chakrabarti and PK Chattopadhyay. Narosa Publishing House Pvt. Ltd., New Delhi
- 1.3 Basic Electrical Engineering by Mool Singh, Galgotia Publication Pvt. Ltd., New Delhi
- 1.4 Principles of Electrical Engineering by BR Gupta, S Chand & Co., New Delhi
- 1.5 Handbook of Electrical Engineering by SL Bhatia, Khanna Publishers, New Delhi

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE: 25)**

**ELECTRONICS - I (122309)**

**Credits- 05**

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**Course 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.

**1. Introduction**

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

**2. Semi-conductor Theory**

- 2.1 Atomic structure, crystalline structure
- 2.2 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
- 2.3 Silicon versus Germanium for mobility and conductivity
- 2.4 Concept of Doping, intrinsic and extrinsic semiconductors
- 2.5 Effect of temperature on intrinsic and extrinsic semiconductors

**3. Semiconductor Diodes**

- 3.1 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
- 3.2 Ideal diode, Semiconductor diode characteristics, static and dynamic resistance
- 3.3 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

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- 3.2 Concept of ripples, filter circuits – shunt capacitor, series inductor, and pie ( $\pi$ ) filters and their applications
- 3.3 Diode ratings/specifications
- 3.4 Various types of diodes such as zener diode, varactor diode, schottky diode, light emitting diode, tunnel diode, photo diode; their working characteristics and applications
- 3.5 Zener diode and its characteristics
- 3.6 Use of zener diode for voltage stabilization

**4. Bi-polar Transistors**

- 3.3 Concept of junction transistor, PNP and NPN transistors, their symbols and mechanism of current flow
- 3.4 Transistor configurations: common base (CB), common emitter (CE) and common collector (CC), current relation and their input/output characteristics; comparison of the three configurations

**5. Transistor Biasing and Stabilization**

- 3.5 Transistor biasing, its need, operating point, effect of temperature on the operating point of a transistor and need of stabilization of operating point.
- 3.6 Different biasing circuits, limitations, simple problems to calculate operating point in different biasing circuits. Use of Thevenin's theorem to determine operating point
- 3.7 Concept of h-parameters of a transistor
- 3.8 Use of data book to know the parameters of a given transistor

**6. Single-Stage Transistor Amplifiers**

- 6.1 Single stage transistor amplifier circuit in CE configuration, function of each component
- 6.2 Working of single stage transistor amplifier, physical and graphical explanation, phase reversal
- 6.3 Concept of DC and AC load line
- 6.4 Voltage gain of single stage transistor amplifier using characteristics of the device
- 6.5 Concept of input and output impedance
- 6.6 AC equivalent circuit of single stage transistor amplifiers
- 6.7 Calculation of voltage gain using AC equivalent circuit
- 6.8 Frequency response of a single stage transistor amplifier

**7. Multi-Stage Transistor Amplifiers**

- 7.1 Need of multi-stage transistor amplifiers – different types of couplings, their purpose and applications.
- 7.2 Knowledge of various terms such as voltage gain, current gain, power gain,

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- frequency response, decibel gain and band width
- 7.3 RC coupled two-stage amplifiers, circuit details, working, frequency response, applications
- 7.4 Loading effect in multistage amplifiers
- 7.5 Elementary idea about direct coupled amplifier, its limitations and applications
- 7.6 Transformer coupled amplifiers, its frequency response. Effect of co-efficient of coupling on frequency response. Applications of transformer coupled amplifiers

**8. Field Effect Transistor (FET)**

- 8.1 Construction, operation, characteristics and applications of a N channel JFET and P channel JFET
- 8.2 JFET as an amplifier
- 8.3 Types, construction, operation, characteristics and applications of a MOSFET
- 8.4 Comparison between BJT, JFET and MOSFET

**RECOMMENDED BOOKS**

- 9. Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi.
- 10. Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New Delhi
- 11. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
- 12. Electronic Components and Materials by SM Dhir, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi.
- 13. Principles of Electronics by SK Bhattacharya and Renu Vig, SK Kataria and Sons, Delhi
- 14. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.
- 15. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill Education Pvt Ltd, New Delhi.
- 16. Basic Electronics – Problems and Solutions by Albert Malvino and David J. Bates; Tata McGraw Hill Education Pvt Ltd, New Delhi.
- 17. Basic Electronics by J.S. Katre, Sandeep Bajaj, Tech. Max. Publications, Pune.
- 18. Analog Electronics by DR Arora, Ishan Publications, Ambala City.
- 19. Analog Electronics by JC Karhara, King India Publication, New Delhi
- 20. Electrical Devices and Circuits by Rama Reddy, Narosa Pulishing House Pvt. Ltd., New Delhi
- 21. Electronic Devices and Circuits by Dharma Raj Cheruku and Battula Tirumala Krishna: Pearson Education (Singapore) Pvt Ltd., Indian Branch, 482 F.I.E Patparganj, Delhi- 92
- 22. Basic Electronics by JB Gupta, SK Kataria and Sons, New Delhi
- 23. Grob's Basic Electronics- A text Lab Manual (Special Indian Edition) by Schultz, Tata McGraw Hill Education Pvt Ltd, New Delhi.

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE: 25)**

**ELECTRICAL AND ELECTRONICS ENGINEERING MATERIALS (125302)**  
Credits- 04 L T P

4 0 0

**Course 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.

**1. Classification**

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

**2. Conducting Material**

2.1 Introduction

2.2 Resistance and factors affecting it such as alloying and temperature etc

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

2.3.1 Copper:

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

2.3.2 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.

2.3.3 Steel:

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

2.3.4 Introduction to bundle conductors and its applications.

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

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- 2.4 Applications of special metals e.g. Silver, Gold, Platinum etc.
- 2.5 High resistivity materials and their applications e.g., manganin, constantin, Nichrome, mercury, platinum, carbon and tungsten
- 2.6 Superconductors and their applications

**3. Review of Semi-conducting Materials**

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

**4. Insulating materials; General Properties:**

- 4.1 Electrical Properties:  
Volume resistivity, surface resistance, dielectric loss, dielectric strength (breakdown voltage) dielectric constant
- 4.2 Physical Properties:  
Hygroscopicity, tensile and compressive strength, abrasive resistance, brittleness
- 4.3 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
- 4.4 Chemical Properties:  
Solubility, chemical resistance, weatherability
- 4.5 Mechanical properties, mechanical structure, tensile structure

**5. Insulating Materials and their applications:**

- 5.1 Plastics
  - 5.1.1 Definition and classification
  - 5.1.2 Thermosetting materials:  
Phenol-formaldehyde resins (i.e. Bakelite) amino resins (urea-formaldehyde and Malamine-formaldehyde), epoxy resins - their important properties and applications.
  - 5.1.3 Thermo-plastic materials:  
Polyvinyl chloride (PVC), polyethelene, silicons, their important properties and applications
- 5.2 Natural insulating materials, properties and their applications
  - Mica and Mica products
  - Asbestos and asbestos products
  - 5. Ceramic materials (porcelain and steatite)



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6. Glass and glass products
7. Cotton
8. Silk
9. Jute
10. Paper (dry and impregnated)
11. 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
14. Gaseous materials; Air, Hydrogen, Nitrogen, SF<sub>6</sub> their properties and applications

**6. Magnetic Materials:**

- 6.1 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.
- 6.2 Soft Magnetic Materials:
  - 6.2.1 Alloyed steels with silicon: High silicon, alloy steel for transformers, low silicon alloy steel for electric rotating machines
  - 6.2.2 Cold rolled grain oriented steels for transformer, Non-oriented steels for rotating machine
  - 6.2.3 Nickel-iron alloys
  - 6.2.4 Soft Ferrites
- 6.3 Hard magnetic materials:  
Tungsten steel, chrome steel, hard ferrites and cobalt steel, their applications

**7. Special Materials:**

Thermocouple, bimetals, leads soldering and fuses material, mention their applications.

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

**RECOMMENDED BOOKS**

11. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi
12. Electronic Components and Materials by Grover and Jamwal, Dhanpat Rai and Co., New Delhi
13. Electrical Engineering Materials by Sahdev, Unique International Publications
14. Electronic Components and Materials by SM Dhir, Tata Mc Graw Hill, New Delhi
15. Electrical Engineering Materials by PL Kapoor, Khanna Publishers, New Delhi
16. Electrical and Electronics Engineering Materials BR Sharma and Others, Satya Parkashan, New Delhi
17. Electrical and Electronics Engineering Materials DR Arora, Ishan Publications, Ambala City

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**COMPUTER PROGRAMMING (121310)**

**Credits- 03**

**L T P**

**3 0 0**

**Course 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.

**1. Algorithm and Program Development**

- 1.1 Steps in development of a program.
- 1.2 Flow-charts, algorithm development
- 1.3 Introduction to various computer languages
- 1.4 Concept of interpreter, compiler, high level language(HLL), machine language (ML) and Assembly Language

**2. Program Structure (C Programming)**

- 2.1 History of 'C', data types, input output statements, arithmetic and logical operations, data assignments, precedence and associativity
- 2.2 I/O statements  
Assignment, Variables, arithmetic operation- their precedence, data types standard I/O function, formulated I/O
- 2.3 Control Statements  
Logical and relational operators; if-else, while, do- while, for loops, breaks, switch statements
- 2.4 Functions:  
Function declaration, parameter passing- by value, storage classes (Local, Global and Static variables), standard library functions
- 2.5 Arrays:  
Single and multi dimensional arrays, character arrays
- 2.6 Pointers:  
To various data types, pointers in parameters passing, pointers to function
- 2.7 Structures:

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Definition of a structure, pointer to structure, union and array of structure

2.8 Strings:

String processing, functions and standard library function

2.9 Data files:

File handling and manipulation, file reading and writing, Binary and ASCII files, file records using standard function type mouse.

**3. Software Applications in Electrical Engineering**

Computer application overview through various applications software related to Electrical Engineering branch viz: PSIM, PSPICE in Electrical Engineering

**RECOMMENDED BOOKS**

1. Programming in C by Schaum series McGraw Hill
2. Programming in C by Kerning Lan and Richie; Prentice Hall of India, New Delhi
3. Programming in C by Balagurusamy, Tata McGraw Hill, Education Pvt Ltd. New Delhi.
4. Let us C- Yashwant Kanetkar, BPB Publications, New Delhi
5. Vijay Mukhi Series for C and C++
6. Programming in C by R Subburaj, Vikas Publishhing House Pvt. Ltd., Jangpura, New Delhi
7. Programming in C by Kris A Jansa, Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi
8. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi
9. Elements of C by MH Lewin, Khanna Publishers, New Delhi
10. The Complete Reference to Visual Basic 6, by Noel Jerke, Tata McGraw Hill, New Delhi  
Web site [www.Beyondlogic.org](http://www.Beyondlogic.org)
11. Pointers in C by Yashwant Kanetkar, BPB Publishers New Delhi
12. Programming in Applications by Chandershekar, Uneek Publications, Jalandhar
13. The essentials of Computer Organizing and Architecture by Linda Null and Julia Labur, Narosa Publishing House Pvt. Ltd., New Delhi

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE: 25)**

**ELECTRICAL ENGINEERING DESIGN AND DRAWING (125303)**

**Credits- 05**

**L T P**

**2 0 6**

**Course Objective**

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

- 2.15 Read, understand and interpret engineering drawings
- 2.16 Communicate and co-relate through sketches and drawings
- 2.17 Prepare working drawings of panels, transmission and distribution

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

**1. Symbols and Signs Conventions (2 Sheets)**

Various Electrical Symbols used in Domestic and Industrial Installation and Power System as per BIS.

**2. Panels/Distribution Boards (3 Sheets)**

Design and Drawing of panels/Distribution board using MCBS, ELCB main switches and change over switches for domestic installation, industrial and commercial installation.

**3. Orthographic projections of Simple Electrical Parts (4 Sheets)**

Bus bar post/ Kit Kat

Pin type and shackle type insulator (Pin Type 11kV/66kV)

Bobbins of a small transformer / choke

Stay insulators/Suspension type insulators

Free hand sketching of M.C.B. and E.L.C.B Placed on Distribution Board.

**4. Orthographic Projection of Machine Parts (4 Sheets)**

Rotor of a squirrel cage induction motor

Motor body (induction motor) as per IS Specifications (using outside dimensions)

Slip rings of 3-phase induction Motor.

Stator of 3 phase Induction motor (Sectional View)

**5. Contactor Control Circuits: Schematic and wiring diagram.(3 Sheets)**

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DOL Starter of 3-phase induction Motor.

Forwarding/reversing of 3-phase induction motor

Limit switch control of a 3-phase induction motor

Sequence operation of two motors using T.D.R. Two speed motor control.

Automatic star-delta starter for 3-phase induction motor.

**RECOMMENDED BOOKS**

1. Electrical Engineering Design and Drawings by Surjeet Singh, Dhanpat Rai and Co, New Delhi
2. Electrical Engineering Design and Drawings by SK Bhattacharya, SK Kataria and Sons, New Delhi
3. Electrical Engineering Design and Drawings by Ubhi & Marwaha, IPH, New Delhi
4. Electrical Design and Drawing by SK Sahdev, Uneek Publications, Jalandhar
5. Electrical Engineering Drawing by Surjit Singh, SK Kataria and Sons, New Delhi

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE: 25)**

**ELECTRICAL WORKSHOP PRACTICE – I (125304 )**

**Credits- 01**

**L T P**

**0 0 2**

**Course 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.

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 Britania joint
  - 2.5 Twist sleeve joint
  - 2.6 Bolted type joint
3. Types of wiring and to make different light control circuits in the following types of wiring.
  - 3.1 Casing and capping (PVC) wiring.
  - 3.2 Conduct wiring (surface/concealed), 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/assembly of Distribution Board and Extension Board
  - (a) Construction of an extension board with two 5A sockets and one 15A Socket controlled by their respective switches, a fuse and indicator with series test lamp provision.
  - (b) Assembly of distribution board panel using MCB, main switch, change over switch and ELCB and RCCB.
  - (c) Wiring of main distribution board with four outgoing circuits for light and fan loads including main switch and fuses (only internal connection)

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- 4.7 Simple light and Alarm Circuits(any four)
- (a) One lamp controlled by two switches (staircase circuit)
  - (b) Two lamps controlled by three switches (double staircase circuit)
  - (c) Two ordinary bells (for day and night) used at a distant residence Bell response circuit using one bell and one relay
  - (d) Bell response circuit of an office (for three rooms) Traffic light control system for two roads crossing.
  - (e) 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
- 4.8 Wiring of a series test lamp board and to use it for finding out simple faults
- 4.9 Testing of domestic wiring installation using meggar
- 4.10 Fault finding and repair of a tube light circuit
- 4.11 Wiring and testing of alarm and indicating circuits using relay, push buttons and bells (simple single phase circuits)
- 4.12 Assembly of distribution board/ panel using MCB, main switch, changeover switch and ELCB etc.

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**FUNDAMENTALS OF ELECTRICAL ENGINEERING LAB (125305)**

Credits- 01

L T P

0 0 2

**LIST OF PRACTICALS**

1. (a) Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions to verify ohm's law  
(b) Filament lamp
  - measure the resistance of a cold lamp filament with the help of calculations.
  - measure the current drawn by the lamp at different voltages from zero to 220 volts and the resistance of lamp at different voltages, plot a graph between current and voltage
2. (a) To verify that  $R_t = R_1 + R_2 + \dots$  where  $R_1, R_2$  etc. are resistances connected in series  
(b) To verify 
$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_m}$$
Where  $R_1, R_2$  etc. are resistances connected in parallel
3. Verification of Kirchoff's current and voltage laws applied to DC circuits
  - a) to construct a circuit arrangement consisting of resistances in series, parallel combination
  - b) identification of node points in the circuit
  - c) to see that algebraic sum of currents at node point is zero
  - d) to see that algebraic sum of emfs and voltage drops in a closed loop is zero
4. To observe the a.c and d.c wave shapes on CRO.
5. To find ratio of inductance values of a coil having air /iron core respectively and to see the effect of introduction of a magnetic core on coil inductance
  
12. To construct an RL and RC circuit and to measure
  - their impedance
  - phase angle between voltage and current
  - construct impedance triangle
13. To plot a graph between current and frequency of RLC series circuit for resonance conditions

OR

To find resonance conditions in RLC series circuit by changing the values of L and C
21. Measurement of power and power factor of a single phase RLC circuit. To calculate KVA and KVAR
22. Measurement of power and power factor of a 3-phase circuit by using 2- wattmeter



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method using induction motor as a load and to calculate KVA and KVAR

23. Testing a battery for its charged condition and to charge it

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**ELECTRONICS-I LAB (122310)**

**Credits- 01**

**L T P**

**0 0 2**

**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) 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 study the effect of coupling capacitor on lower cut off frequency and upper cut off frequency by plotting frequency response curve of a two stage RC coupled amplifier
12. To plot V-I characteristics of a FET

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**COMPUTER PROGRAMMING LAB (121311)**

**Credits- 01**

**L T P**

**0 0 2**

**LIST OF PRACTICALS**

1. Programming exercise on executing a C Programs. Programming exercise on editing a C program.
2. Programming exercise on defining variables and assigning values to variables
3. Programming exercise on arithmetic and relation operators
4. Programming exercise on arithmetic expressions and their evaluation
5. Programming exercise on reading a character
6. Programming exercise on writing a character Programming exercise on formatting input using print
7. Programming exercise on formatting output using scan Programming exercise on simple IF statement
8. Programming exercise on IF... ELSE statement Programming exercise on SWITCH statement
9. Programming exercise on GOTO statement
10. Programming exercise on DO-WHILE statement Programming exercise on FOR statement
11. Programming exercise on one dimensional arrays Programming exercise on two dimensional arrays

Demonstration of Application software to Electrical Engineering branch such as: MATLAB, PSIM, MULTISIM, PSPICE in Electrical Engineering

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Credits- 04

L T P

4 0 0

**Course 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.

**1. Introduction to Electrical Machines**

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

**2. DC Machines**

- 1.7 Main constructional features, Types of armature winding
- 1.8 Function of the commutator for motoring and generation action
- 1.9 Factors determining induced emf
- 1.10 Factors determining the electromagnetic torque
- 1.11 Significance of types of machines
- 1.12 Significance of back e.m.f., the relation between back emf and Terminal voltage
- 1.13 Armature Reaction
- 1.14 Methods to improve commutation
- 1.15 Performance and characteristics of different types of DC motors
- 1.16 Speed control of dc shunt/series motors
- 1.17 Need of starter, three point dc shunt motor starter and 4 point starter
- 1.18 Applications of DC motors
- 1.19 Faults in dc machines and their retrospective
- 1.20 Losses in a DC machine
- 1.21 Determination of losses by Swinburne's test

**3. Transformers (single phase)**

- 2.12 Introduction
- 2.13 Constructional features of a transformer and parts of transformer
- 13. Working principle of a transformer
- 14. EMF equation
- 15. Transformer on no-load and its phasor diagram

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16. Transformer – neglecting voltage drop in the windings – Ampere turn balance – its phasor diagram
17. Mutual and leakage fluxes, leakage reactance
18. Transformer on load, voltage drops and its phasor diagram
19. Equivalent circuit
20. Relation between induced emf and terminal voltage, regulation of a transformer-mathematical relation
21. Losses in a transformer
22. Open circuit and short circuit test. Calculation of efficiency, condition for maximum efficiency-maintenance of Transformer, scheduled Maintenance
23. Auto transformer construction, working and applications
24. Different types of transformers including dry type transformer.

**4. Transformers three phase**

- 3.6 Construction of three phase transformers and accessories of transformers such as Conservator, breather, Buchhol Relay, Tap Changer (off load and on load) (Brief idea)
- 3.7 Types of three phase transformer i.e. delta-delta, delta-star, star-delta and star-star
- 3.8 Conditions for parallel operation (only conditions are to be studied)
- 3.9 On load tap changer
- 3.10 Difference between power and distribution transformer
- 3.11 Cooling of transformer

**RECOMMENDED BOOKS**

1. Electrical Machines by SK Bhattacharya, Tata Mc Graw Hill, Education Pvt Ltd. New Delhi
2. Electrical Machines by SK Sahdev, Uneek 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
6. Electrical Machines by Smarajit Ghosh-Pearson Publishers, Delhi

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**ELECTRICAL MEASURING INSTRUMENTS AND  
INSTRUMENTATION (125402)**

**Credits- 05**

**L T P**  
**5 0 0**

**Course 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 he 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.

**1. Introduction to Electrical Measuring Instruments:**

- 2 Concept of measurement and instruments
- 3 Concept of measurement of electrical quantities and instruments for their measurements
- 4 Types of electrical measuring instruments – indicating, integrating and recording type instruments
- 5 Essentials of indicating instruments – deflecting, controlling and damping torque

**2. Ammeters and Voltmeters (Moving coil and moving iron type):**

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

**3. Wattmeters (Dynamometer Type)**

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

**4. Energymeter (Induction type):**

- 4.1 Construction, working principle, merits and demerits of single-phase and three-phase energy meters
- 4.2 Errors and their compensation
- 4.3 Simple numerical problems

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4.4 Construction and working principle of maximum demand indicators

**5 Miscellaneous Measuring Instruments:**

3. 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)
4. Instrument Transformers: Construction, working and applications of CT  
PT and their ratio and phase angle error

**6. Electronic Instruments:**

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

**7. LCR meters:**

Study of LCR meters and their applications

**8. Power Measurements in 3-phase circuits by**

- (i) Two wattmeter method in balanced and imbalanced circuits and simple problems
- (ii) Three wattmeter method

**9. Measurement of Non-electrical Quantities (Introduction only)**

Basic concept of pressure measurement, flow measurement, level measurement, displacement measurement using transducers

**10. Measurement of Temperature**

Different types of thermometers, thermocouple, resistance temperature detector and their construction, principle and working.

**RECOMMENDED BOOKS**

1. Electrical Measurements and Measuring Instruments by Golding and Widdis; Wheeler Publishing House, New Delhi
2. Electrical Measurements and Measuring Instruments by SK Sahdev, Unique International Publications, Jalandhar
3. A Course in Electrical Measurement and Measuring Instruments by AK Sawhney and PL Bhatia; Dhanpat Rai and Sons, New Delhi
4. Electric Instruments by D. Cooper
5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi, New Age International (P) Ltd., Publishers, New Delhi
6. Electronics Instrumentation by Umesh Sinha, Satya Publication, New Delhi
7. Basic Electrical Measurements by Melville B. Staut.
8. Electrical Measurement and Measuring Instruments by JB Gupta, SK Kataria and Sons, New Delhi
9. Electrical Measurement and Measuring Instruments by ML Anand, SK Kataria and Sons, New Delhi

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**ELECTRONICS - II (122410)**

**Credits- 04**

**L T P**

**4 0 0**

**Course 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.

**1. Transistor Audio Power Amplifier**

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

**2. Tuned Voltage Amplifier**

- 2.1 Introduction
- 2.2 Series and parallel resonance ( No mathematical derivation)
- 2.3 Single and double tuned voltage amplifiers
- 2.4 Frequency response of tuned voltage amplifiers
- 2.5 Applications of tuned voltage amplifiers

**3. Feedback in Amplifiers**

- 2.2 Feedback and its importance, positive and negative feedback and their need

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

- 2.6 Effect of negative feedback on voltage gain, stability, distortion, band width, output and input impedance of an amplifier (No mathematical derivation)
- 2.7 Typical feedback circuits
  - (a) Effect of removing the emitter by-pass capacitor on a CE transistor amplifier
- 3.6 Emitter follower and its applications



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**4. Sinusoidal Oscillators**

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

**5. Wave-Shaping and Switching Circuits**

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

**6. Power supplies:**

Working Principles of different types of power supplies viz. CVTs, UPS, Stabilizers, SMPS, IC voltage regulator (78 XX,79XX)

**7. Operational Amplifier**

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

**RECOMMENDED BOOKS**

- 5.2 A text book of Basic Electronics and Linear Circuits by NN Bhargava and others, Tata McGraw Hill, New Delhi
- 5.3 Electronics Principles by SK Sahdev, Dhanpat Rai and Co., New Delhi
- 5.4 Electronics Principles by Albert Paul Malina, Tata McGraw Hill, New Delhi
- 5.5 Operational Amplifiers and Linear Circuits by Rama Kant and A. Gaykwad, Prentice Hall of India, New Delhi
- 5.6 Electronic Devices Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
- 5.7 Electronic Devices and Circuits by Millman and Halkias, McGraw Hill, New Delhi
- 5.8 Analog Electronics – II by DR Arora, Ishan Publication, Ambala
- 5.9 Electronic Devices and Circuits by JC Karhara, King India Publication, New Delhi

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- 5.10 Electronic Devices and Circuits-I, Eagle Prakashan, Jalandhar
- 5.11 Electronic Devices Circuits by JB Gupta, SK Kataria and Sons, New Delhi

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**ESTIMATING AND COSTING IN ELECTRICAL  
ENGINEERING (125403)**

Credits- 03

L T P

3 0 0

**Course 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.

**1. Introduction**

Purpose of estimating and costing, proforma for making estimates, preparation of materials schedule, costing, price list, preparation of tender document (with 2-3 exercises), 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.

**2. 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)

**3. Estimating and Costing:**

- 3.1 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)
- 3.2 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)
- 3.3 Service line connections estimate for domestic and Industrial loads (over head and under ground connections) from pole to energy meter.

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**4. 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, earthing of substations, Key Diagram of 66 KV/11KV Substation.

Single line diagram, layout sketching of outdoor, indoor 11kV sub-station or 33kV sub-station

**RECOMMENDED BOOKS**

- 2.3.6 Electrical Installation, Estimating and Costing by JB Gupta, SK Kataria and Sons, New Delhi
- 2.3.7 Estimating and Costing by SK Bhattacharya, Tata McGraw Hill, New Delhi
- 2.3.8 Estimating and Costing by Surjeet Singh, Dhanpat Rai & Co., New Delhi
- 2.3.9 Estimating and Costing by Qurashi
- 2.3.10 Estimating and Costing by SL Uppal, Khanna Publishers, New Delhi
- 2.3.11 Electrical Estimating and Costing by N Alagappan and B Ekambaram, TMH, New Delhi

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT (120401)**

**Credits- 03**

**L T P**

**3 0 0**

**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 aim 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.

**DETAILED CONTENTS**

1. Introduction to Generic Skills
  3. Importance of Generic Skill Development (GSD)
  4. Global and Local Scenario of GSD
  5. Life Long Learning (LLL) and associated importance of GSD.
2. Managing Self
  - 2.1 Knowing Self for Self Development  
Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.
  - 2.2 Managing Self - Physical  
Personal grooming, Health, Hygiene, Time Management
  - 2.3 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

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Note: Practical sessions should be coupled with teaching of effective listening, speaking, reading and writing.

2.4 Managing Self – Psychological

Stress, Emotions, Anxiety-concepts and significance (Exercises related to stress management)

Techniques to manage the above

3. Managing in Team

2.5 Team - definition, hierarchy, team dynamics

2.6 Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background

2.7 Communication in group - conversation and listening skills

4. Task Management

3.4 Task Initiation, Task Planning, Task execution, Task close out

3.5 Exercises/case studies on task planning towards development of skills for task management

5. Problem Solving

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.

6. Entrepreneurship

6.1 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.

6.2 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

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Assessment of demand and supply in potential areas of growth.  
Understanding business opportunity  
Considerations in product selection  
Data collection for setting up small ventures.

- 7.5 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**

8. Soft Skills for Interpersonal Communication by S.Balasubramaniam; Published by Orient BlackSwan, New Delhi
  12. Generic skill Development Manual, MSBTE, Mumbai.
  13. Lifelong learning, Policy Brief ([www.oecd.org](http://www.oecd.org))
  14. Lifelong learning in Global Knowledge Economy, Challenge for Developing Countries – World Bank Publication
  15. Towards Knowledge Society, UNESCO Paris Publication
  16. Your Personal Pinnacle of Success by DD Sharma, Sultan Chand and Sons, New Delhi
  17. Human Learning, Ormrod
  18. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
  19. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
- Handbook of Small Scale Industry by PM Bhandari

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**PC MAINTENANCE AND REPAIR LAB (121406)**

**Credits- 03**

**L T P**

**0 0 6**

**Course 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.

**LIST OF PRACTICALS**

- 2.7 Introduction to Computer hardware components
- 2.8 Familiarization with PC assembling and disassembling.
- 2.9 BIOS configuration and settings.
- 2.10 Installation of Hard-Disk drive including partitioning and formatting.
- 2.11 Familiarization with cables i.e. co-axial, UTP and fiber-optic cable and their installation
- 2.12 Installation and configuration of dial-up networking for Broad band internet
- 2.13 Installation of Windows Operating Systems
- 2.14 How to make an E-mail-ID on internet.
- 2.15 Installation of a printer on different operating systems
- 2.16 Virus – removal and use of anti-virus down loads etc.
- 2.17 Installation of
  - CD or DVD Drive
  - Sound card, Speaker and headphone
  - Printer drivers
  - Software
- 2.18 Downloading of various software
- 2.19 Recognition of USB port and other parts like thumb drive or Card Reader etc.
- 2.20 (a) Replacement of RAM
  - Replacement of Power Supply



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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**RECOMMENDED BOOKS**

- 3.2 Hardware Bible ; Winn. L. Rosch, Techmedia
- 3.3 PC Maintenance and Repair by Mohit Sofat; Ishan Publications, Ambala
- 3.4 The complete PC Upgrade and Maintenance Guide, Mark Minasi, BPB Publications, New Delhi
- 3.5 Computer Networks, A. Tanenbaum, PHI Ltd., New Delhi
- 3.6 PC Maintenance and Troubleshooting by “Biglow”
- 3.7 PC Upgrading, Maintenance and Troubleshooting Guide by SK Chouhan ; SK Kataria and Sons, New Delhi

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**ELECTRICAL WORKSHOP PRACTICE – II (125404)**

Credits- 01

L T P

0 0 2

**Course 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.

- 3.7 To carry out pipe/plate earthing for a small house and 3-phase induction motor.  
Testing the earthing using earth tester
- 3.8 Connections of single phase and 3-phase motors, through an appropriate starter and to change their direction of rotation
- 3.9 Wiring, testing and fault finding of the following contactor control circuits operating on 3-phase supply:
  - Remote control circuits
  - Time delay circuits
  - Inter locking circuits
  - Sequential operation control circuits

Note: Students may be asked to study control circuit of a passenger lift, automatic milling machine, etc. using relays

- 4. Winding/re-winding of a fan (ceiling and table),choke, single phase and three phase induction motor.
- 5. Power cable jointing using epoxy based jointing kits
- 6. Demonstration of laying of underground cables at worksite
- 7. Dismantling/assembly of star-delta and DOL starter
- 8. Dismantling and assembly of voltage stabilizers
- 9. Repair and maintenance of domestic electric appliances, i.e. electric iron, geyser, fan, heat convector, desert cooler, room heater, electric kettle, electric oven, electric furnace etc.
- 10. Dismantling/assembly/maintenance of motor operated appliances such as mixer, blender, drill machine etc.

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**ELECTRICAL MACHINES - I LAB (125405)**

**Credits- 01**

**L T P**

**0 0 2**

**LIST OF PRACTICALS**

- 5.9. To measure 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

- 6.7. Speed control of dc shunt motor (i) Armature control method (ii) Field control method
- 6.8. Study of dc series motor with starter (to operate the motor on no load for a moment)
- 6.9. Determination of efficiency of DC motor by Swinburne's Test at (i) rated capacity (ii) half full load
- 6.10. To perform open circuit and short circuit test for determining: (i) equivalent circuit (ii) the regulation and (iii) efficiency of a transformer from the data obtained from open circuit and short circuit test at full load
- 2.4 To find the efficiency and regulation of single phase transformer by actually loading it.
- 2.5 Checking the polarity of the windings of a three phase transformer and connecting the windings in various configurations
- 2.6 Finding the voltage and current relationships of primary and secondary of a three phase transformer under balanced load in various configurations conditions such as
- 2.1.1 Star-star
  - 2.1.2 Star delta
  - 2.1.3 Delta star
  - 2.1.4 Delta - Delta configuring conditions.

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**ELECTRICAL MEASURING INSTRUMENTS AND  
INSTRUMENTATION LAB (125406)**

**Credits- 01**

**L T P**

**0 0 2**

**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. Use of LCR meter for measuring inductance, capacitance and resistance.
9. To record all electrical quantities from the meters installed in the institution premises.
10. To measure Energy at different Loads using Single phase Digital Energy meter.

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**ELECTRONICS – II LAB (122411)**

**Credits- 01**

**L T P**

**0 0 2**

**LIST OF PRACTICALS**

- 6.9 To measure (a) optimum load (b) output power (c) signal handling capacity of a push-pull amplifier
- 6.10 To observe the effect of negative current feedback on the voltage gain of a single stage transistor amplifier by removing emitter by-pass capacitor.
- 6.11 To measure (a) voltage gain (b) input and output impedance for an emitter follower circuit
- 6.12 To measure frequency generation in (a) Hartley (b) R-C Phase Shift oscillator
- 6.13 To observe the differentiated and integrated square wave on a CRO for different values of R-C time constant

7.3 Clipping of both portion of sine-wave using:

diode and dc source

zener diodes

Clamping a sine-wave to:

4.3.Negative dc voltage

4.4.Positive dc voltage

- 2.10 To generate square-wave using an astable multivibrator and to observe the wave form on a CRO
- 2.11 To observe triggering and working of a bistable multivibrator circuit and observe its output wave form on a CRO
- 2.12 To use the op-Amp (IC 741) as inverting one and non-inverting amplifiers, adder, comparator, integrator and differentiator
- 2.13 To study the pin configuration and working of IC 555 and its use as monostable and astable multivibrator
- 2.14 To realize the regulated power supply by using three terminal voltage regulator ICs such as 7805, 7905, 7915 etc.

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**ELECTRICAL MACHINES-II (125501)**

**Credits- 04**

**L T P**

**4 0 0**

**Course 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

**1. Synchronous Machines**

- 1.22 Main constructional features of synchronous machine including commutator and brushless excitation system
- 1.23 Generation of three phase emf
- 1.24 Production of rotating magnetic field in a three phase winding
- 1.25 Concept of distribution factor and coil span factor and emf equation Armature reaction at unity, lag and lead power factor
- 1.26 Operation of single synchronous machine independently supplying a load - Voltage regulation by synchronous impedance method
- 1.27 Need and necessary conditions of parallel operation of alternators Synchronizing an alternator (Synchroscope method) with the bus bars
- 1.28 Operation of synchronous machine as a motor –its starting methods
- 1.29 Effect of change in excitation of a synchronous motor
- 1.30 Concept and Cause of hunting and its prevention
- 1.31 Rating and cooling of synchronous machines
- 1.32 Applications of synchronous machines (as an alternator, as a synchronous condenser)

**2. Induction Motors**

- 2.14 Salient constructional features of squirrel cage and slip ring 3-phase induction motors
- 2.15 Principle of operation, slip and its significance
- 2.16 Locking of rotor and stator fields
- 2.17 Rotor resistance, inductance, emf and current
- 25. Relationship between copper loss and the motor slip
- 26. Power flow diagram of an induction motor
- 27. Factors determining the torque

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28. Torque-slip curve, stable and unstable zones
  29. Effect of rotor resistance upon the torque slip relationship
  30. Double cage rotor motor and its applications
  31. Starting of 3-phase induction motors, DOL, star-delta, auto transformer
  32. Causes of low power factor of induction motors
  33. Testing of 3-phase motor on no load and blocked rotor test and to find efficiency
  34. Speed control of induction motor
  35. Harmonics and its effects, cogging and crawling in Induction Motors.
- 3. Fractional Kilo Watt (FKW) Motors**
- 3.12 Single phase induction motors; Construction characteristics and applications
  - 3.13 Nature of field produced in single phase induction motor
  - 3.14 Split phase induction motor
    - Capacitors start and run motor
    - Shaded pole motor
    - Reluctance start motor
  - 3.15 Alternating current series motor and universal motors
  - 3.16 Single phase synchronous motor
    - 3.5.1 Reluctance motor
    - 3.5.2 Hysteresis motor
- 4. Special Purpose Machines**
- Construction and working principle of linear induction motor, stepper motor, Servomotor, Submersible Motor, Introduction to Energy efficient Motors.

**RECOMMENDED BOOKS**

- d. Electrical Machines by SK Bhattacharya, Tata Mc Graw Hill, New Delhi
- e. Electrical Machines by SK Sahdev, Uneek Publications, Jalandhar
- f. Electrical Machines by Nagrath and Kothari, Tata Mc Graw Hill, New Delhi
- g. Electrical Engineering by JB Gupta, SK Kataria and sons, New Delhi
- h. Electrical Machines by Samarjit Ghosh, Pearson Education (Singapore) Pte, Ltd. 482, FIE Patparganj, Delhi 110092
- i. Electrical Machines by DR Arora, Ishan Publications, Ambala City.
- j. Electrical Machines-II by Mandeep Singh- Ishan Publication
- k. Electrical Machines-II by G.L. Marwaha, Eagle Parkashan, Jalandhar.

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**ELECTRICAL POWER – I (125502)**

**Credits- 05**

**L T P**

**5 0 0**

**Course 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.

**1. Power Generation**

- 1.1 Main resources of energy, conventional and non-conventional
- 1.2 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.
- 1.3 Importance of non-conventional sources of energy in the present scenario. Brief details of solar energy, bio-energy, wind energy

**2. Economics of Generation**

8. 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.
9. Base load and peak load power stations, inter-connection of power stations and its advantages, concept of regional and national grid.

**3. Transmission Systems**

11. Layout of transmission system, selection of voltage for H.T and L.T lines, advantages of high voltage for Transmission both AC and DC
12. Comparison of different system: AC versus DC for power transmission, conductor material and sizes from standard tables
13. Constructional features of transmission lines: Types of supports, types of insulators, Types of conductors, Selection of insulators, conductors, earth wire and their accessories, Transposition of conductors and string efficiency of suspension type insulators, Bundle Conductors.
10. Mechanical features of line: Importance of sag, calculation of sag, effects



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of wind and ice related problems; Indian electricity rules pertaining to clearance

11. Electrical features of line: Calculation of resistance, inductance and capacitance without derivation in a.c. transmission line, voltage regulation, and concept of corona. Effects of corona and remedial measures
12. Transmission Losses

**4. Distribution System**

- 4.1 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
- 4.2 Preparation of estimates of HT and LT lines (OH and Cables).
- 4.3 Constructional features of LT (400 V), HT (11 kV) underground cables, advantages and disadvantages of underground system with respect to overhead system.
- 4.4 Calculation of losses in distribution system
- 4.5 Faults in underground cables-determine fault location by Murray Loop Test, Varley Loop Test

**5. Substations:**

- 1.9 Brief idea about substations; out door grid sub-station 220/132 KV, 66/33 KV outdoor substations, pole mounted substations and indoor substation
- 1.10 Layout of 33/11 kV/400V distribution substation and various auxiliaries and equipment associated with it

**6. Power Factor:**

- 2.6 Concept of power factor
- 2.7 Reasons and disadvantages of low power factor  
Methods for improvement of power factor using capacitor banks, VAR Static Compensator (SVC)

**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, Uneek 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. Electrical Power-I by G.L. Marwaha, Eagle Parkashan, Jalandhar.

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7. Sub-Station Design by Satnam, Dhanpat Rai and Co., New Delhi
8. Electrical Power-I by Mandeep Singh - Ishan Publication
9. Electrical Power Distribution System by AS Pabla, Tata McGraw Hill, New Delhi
10. Electrical Power System by S Channi Singh, Tata McGraw Publishing Co. New Delhi

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**INDUSTRIAL ELECTRONICS AND CONTROL OF DRIVES**  
**(125503)**

Credits- 04

L T P

4 0 0

**Course 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.

**1. 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
- 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.

**2. Controlled Rectifiers**

- 3.7 Single phase half wave controlled rectifier with resistive load and inductive load, concept of free wheeling diode.
- 3.8 Single phase half controlled full wave rectifier
- 3.9 Single phase fully controlled full wave rectifier bridge.
- 3.10 Single phase full wave centre tapped rectifier
- 3.11 Three phase full wave half controlled bridge rectifier
- 3.12 Three phase full wave fully controlled bridge rectifier

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- 3. Inverters, Choppers, Dual Converters and Cyclo Convertors**
  12. Inverter-introduction, working principles, voltage and current driven series and parallel inverters and applications
  13. Choppers-introduction, types of choppers and their working principles and applications
  14. Dual converters-introduction, working principles and applications
  15. Cyclo-converters- introduction, types, working principles and applications
  
- 4. Thyristor Control of Electric Drives**
  13. DC drives control (Basic Concept)
  14. Half wave drives
  15. Full wave drives
  16. Chopper drives
  17. AC drives control
  18. Phase control
  19. Variable frequency a.c. drives
  20. Constant V/F application
  21. Voltage controlled inverter drives
  22. Constant current inverter drives
  23. Cyclo convertors controlled AC drives
  24. Slip control AC drives
  
- 5. Uninterrupted power supplies**
  14. UPS online, off line
  15. Storage devices (batteries)

**BOOKS RECOMMENDED**

- 1.7 Industrial Control Electronics. John Webb, Kevin Greshock, Maxwell, Macmillan International editions.
- 1.8 Fundamentals of Power Electronics by S Rama Reddi, Narosa Publishing House Pvt. Ltd, New Delhi
- 1.9 Power Electronics, Circuits Devices and Applications by Mohammad H. Rashid
- 1.10 Power Electronics by PC Sen
- 1.11 Power Electronics by Dr. PS Bhimbra, Khanna Publishers, New Delhi
- 1.12 Industrial Electronics & Control of Drives by Deepak Arora, Eagle Parkashan, Jalandhar.
- 1.13 Industrial Electronics & Control by SK Bhattacharya & S Chatterji, New Age international Publications(P) Ltd, New Delhi
- 1.14 Power Electronics by SK Sahdev, Uneek Publication, Jalandhar
- 1.15 Industrial Power Electronics by JC Karhava, King India Publication,
- 1.16 Fundamentals of Electrical Drives by Gopal K Dubey, Narosa Publishing House Pvt. Ltd, New Delhi

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**Elective - I**  
**(a) INSTRUMENTATION (122504)**

Credits- 03

L T P

3 0 0

**Course Objective**

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

**1. Measurements:**

Importance of measurement, Basic measuring systems, advantages and limitations of each measuring systems, generalized measurement system, signal conditioning and display devices

**2. Transducers:**

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

**3. Measurement of Displacement and Strain:**

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

**4. Force and Torque Measurement:**

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

**5. Pressure Measurement:**

Bourdon pressure gauges, electrical pressure pickups and their principle, construction and applications. Use of pressure cells.

**6. Flow Measurement:**

Basic principles of magnetic and ultrasonic flow meters

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**7. Measurement of Temperature:**

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

13. **Measurement of other non electrical quantities** such as humidity, pH level and vibrations

**RECOMMENDED BOOKS**

24. Electronic Measurement and Instrumentation by Dr Rajendra Prasad
25. Electronic Measurement and Instrumentation by JB Gupta, SK Kataria and Sons, New Delhi
26. Instrumentation by Rajeev Sapra - Ishan Publication
27. Electrical and Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Co., New Delhi
28. Electronic Instrumentation and Measurement Techniques by WD Cooper, AD Helfrick Prentice Hall of India Pvt. Ltd. New Delhi
29. Industrial Instrumentation by Umesh Rathore, SK Kataria and Sons, New Delhi

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**Elective - I**  
**(b) OPTICAL FIBER COMMUNICATION (122602)**

Credits- 03

L T P

3 0 0

**Course Objective**

Progressing from communication over copper wire to today's fiber optic communication, we have increased our ability to transmit larger information, more quickly covering even longer distances. This has expanded our boundaries and it finding a good slot in communication system. It has gradually replaced the old technology of electrical communication. Operational fiber optical systems are now in common and new installations and applications appear continually. The growth is expected to continue for many years. Basic concepts and techniques of optical fiber communication have been dealt with in this subject.

**1. Introduction**

Historical perspective, basic communication systems, optical frequency range, advantages optical fiber communication, application of fiber optic communication

**2. Light Wave Fundamentals**

Nature of light, acceptance angle and numerical aperture, electromagnetic waves, dielectric wave guide, modes in planar guide, dispersion and distortion in wave guide.

**3. Optical Fiber Waveguides**

Fiber structure, step-index fiber, graded – index fiber, attenuation, modes in step, index and graded index fibers, pulse dispersion and information rate in optical fibers, construction of optical fibers, optical fiber cables.

**4. Light Sources**

Light emitting diodes (LEDs), Operating characteristics of LEDs, Laser principles, different types of lasers, laser diodes, operating characteristics of laser-diodes, distributed feedback laser diode, optical amplifier, fiber laser.

**5. Light Detectors**

Principles of photodetection, photomultiplier semiconductor photodiode,

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PIN diode and Avalanche Photo Diode (APD), comparison. Between PIN diode and APD.

**6. Optical Fiber Joints**

Fiber, alignment and joint loss, fiber end preparation, splices, connectors, source coupling.

**7. Distribution Networks and Fiber Components**

Distribution network, directional couplers, star couplers, switches, fiber optical isolators, attenuators, wave length division multiplexing.

**RECOMMENDED BOOKS**

1. Optical Fiber Communication by Joseph. C. Palais, Pearson Education Publications, Published by Addison Wesley Longman (Singapore) Pte. Ltd., Delhi.
2. Optical Fiber Communication and its Applications by S.C.Gupta, Prentice Hall India – New Delhi.
3. Fiber-Optic Communication Systems by G.P. Agrawal; John Wiley and Sons, New Delhi
4. Optical Fibers Communication, by John M. Senior, Prentice Hall India, New Delhi.
11. Optical Communication Systems by J. Gower; Prentice Hall India, New Delhi.
12. Optical Fiber Communication by Naveen Kumari, Eagle Parkashan, Jalandhar.
13. Optical Fiber Communication by Gerd Keiser; Mc Graw Hill, International Editions.
14. Optical Communication: Components and Systems by Franz, J.H, Narosa Publishing House Pvt. Ltd. Darya Ganj New Delhi
15. Technician Guide to Fiber-Optics by Donald J Sterling, Vikas Publishing House Pvt Ltd, Jangpura, New Delhi
16. Optical Fiber Communication by Yash Pal – Ishan Publication



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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**DIGITAL ELECTRONICS AND MICROPROCESSORS (122511)**

**Credits- 04**

**L T P**

**4 0 0**

**Course 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.

**1. Number Systems**

- 1.1 Decimal, binary, octal and hexa-decimal number systems and their inter-conversion
- 1.2 Binary and Hexadecimal addition, subtraction and multiplication
- 1.3 1's and 2's complement methods of addition/subtraction

**2. Gates**

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

**3. Boolean Algebra**

- 3.1 Boolean Relations and their applications
- 3.2 DeMorgan's Theorems
- 3.3 K-Map upto four variables

**4. Combinational Circuits**

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

**5. Flip-Flops**

- 5.1 J-K Flip-Flop

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- 5.2 R-S Flip-Flop
- 5.3 D-Type Flip-Flop
- 5.4 T-Type Flip-Flop
- 5.5 Applications of Flip-Flops

**6. Introduction of Shift Registers and Counters**

**7. A/D and D/A Converters**

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

**8. Semi-conductor Memories**

Types, merits, demerits, and applications

**(PART-B)**

**1. Microprocessor**

- 1.1 Study of 8085 microprocessor architecture, pin configuration, bus organisation, registers flags, interrupts
- 1.2 Instruction set of 8085 microprocessor, addressing modes, instruction format.  
Writing some simple assembly language programmes including debugging.  
Use of stacks and sub-routines in programming
- 1.3 Interfacing and data transfer between peripheral, I/O and microprocessor
- 1.4 Study of peripheral chips – 9155, 8251
- 1.5 Introduction of 16-bit, 32-bit microprocessor, their advantages over 8-bit microprocessor

**RECOMMENDED BOOKS**

- 3.13 Modern Digital Electronics by RP Jain, Tata McGraw Hill, Education Pvt. Ltd. New Delhi
- 3.14 Digital Principles and Electronics by Malvino and Leach, Tata McGraw Hill, New Delhi
- 3.15 Digital Electronics by SN Ali
- 3.16 Digital Electronics by Rajive Sapra, Eshan Publications, Ambala City
- 3.17 Digital Fundamentals by Floyd and Jain, Pearsons Education (Singapore) Pte Ltd Patparganj, Delhi 110092
- 3.18 Digital Electronics & Microprocessor by Deepak Arora, Eagle Parkashan, Jalandhar.
- 3.19 Digital Electronics by Jamwal, Dhanpat Rai and Co. New Delhi
- 3.20 Microprocessors Architecture, Programming and Application with 8085/8080A, Ramesh S Gaonkar, Wiley Eastern Ltd. New Delhi
- 3.21 Introduction to Microprocessors by Aditya Mathur, TMH Publishing Co., New

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- Delhi
- 3.22 Microprocessors and Microcontrollers by BP Singh, Galgotia Publications, New Delhi
  - 3.23 Digital Systems by Sanjay K Bose, Wiley Eastern(P) Ltd. New Delhi
  - 3.24 Digital Systems : principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
  - 3.25 Digital Integrated Circuits by AK Gautam, SK Kataria and Sons, New Delhi
  - 3.26 Microprocessors(The 8086 and 8088) by AK Gautam and A Jaiswal; SK Kataria and Sons, New Delhi
  - 3.27 Digital Electronics And Microprocessors by Rajeev Sapra – Ishan Publication

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**NON-CONVENTIONAL ENERGY SOURCES (125505)**

Credits- 04

L T P

4 0 0

**Course Objective**

Energy is a crucial input in the process of economic, social and industrial development. High-energy consumption has traditionally been associated with higher quality of life, which in turn is related to Gross National Product (GNP). Since the conventional energy resources are under strain of depletion, it is high time to tap the non-conventional energy sources. The electrical diploma holder will have to face this challenge. Therefore this subject is introduced in the curriculum to familiarize the diploma students with non-conventional engineering sources, so that they may exploit them in near future.

**1. Introduction:**

Importance of Non conventional sources of energy, Present Scenario, Future Prospects, Economic Criteria

**2. Solar Energy:**

Principle of conversion of Solar radiation into heat, Photo-voltaic cell, Electricity generation, Application of solar energy like Solar water heaters, Solar Furnaces, Solar cookers, Solar lighting, Solar pumping.

**3. Hydro Energy:**

Hydro-electric Power Plants, Mini and Micro hydro-electric power generation.

**4. Bio-energy:**

Bio-mass Conversion Technologies- wet and dry processes. Methods for obtaining energy from biomass. Power generation by using gasifiers

**5. Wind Energy:**

Wind Energy Conversion, Windmills, Electricity generation from wind- Types of wind mills, local control, energy storage

**6. Geo-thermal and Tidal Energy:**

Geo-thermal sources, Ocean thermal electric conversion, open and closed cycles, hybrid cycles. Prime movers for geo-thermal energy conversion. Steam Generation and electricity generation.

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**7. Magneto Hydro Dynamic (MHD) Power Generation**

**9. Chemical Energy Sources:**

Design and operating principles of a fuel cell, conversion efficiency, work output and e.m.f of fuel cells, applications.

**10. Thermo Electric Power:**

Basic principle, performance analysis of thermo electric power generation, thermoelectric materials and their application.

**RECOMMENDED BOOKS:**

- 4.6 Solar Energy – Principles of Thermal Collection and Storage by SP Sukhatme, Tata McGraw Hill Education Pvt Ltd, New Delhi.
- 4.7 Non-Conventional Energy Resources by RK Singal, SK Kataria and Sons, New Delhi
- 4.8 Solar Energy Utilization; GD Rai ; Khanna Publishers, New Delhi.
- 4.9 Reviews of Renewable Energy Sources, Vol. 3, Edited by MS. Sodha, S.S. Mathur, MAS Malik, TC Kandpal ; Wiley Eastern Limited, New Delhi.
- 4.10 Renewable Energy Sources and Conversion Technology by NK Bansal, Manfred Kleemann, Michael Meliss, Tata McGraw Hill Publishing Co. Ltd New Delhi.
- 4.11 Non Conventional Energy Sources by Gitika Goyal, Eagle Parkashan, Jalandhar.
- 4.12 Energy Today and Tomorrow; Maheshwar Dayal; Publications Division, Ministry of Information and Broadcasting, Govt. of India, New Delhi.
- 4.13 Energy Technology (non-conventional, renewable and conventional) by S Rao and BB Parulekar, Khanna Publishers, New Delhi
- 4.14 Non-Conventional Sources of Energy- Mandeep Singh- Ishan Publication

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**MINOR PROJECT WORK LAB (125506)**

**Credits- 01**

**L T P**

**0 0 2**

**Course Objective**

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 comprehend concepts, principles and practices taught in the classroom and 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 do Market study in the following cases:

1. Various types of cables available in the market, their current rating/specifications, different makes/manufacturing companies (minimum three), comparison of cost between different makes.
2. Various types of domestic/wiring components such as switches, sockets, holders etc., their specifications, different makes or manufacturing companies (minimum three), comparison of cost between different makes.
3. Various types of protective devices used in domestic and industrial wiring such as MCBs, ELCB/RCCB, fuses etc. their specifications, make (minimum three), and comparison of cost between different makes.
4. Various types of electric lamps (lumeneries) available in the market, their specifications, different makes or manufacturing companies (minimum three), comparison of cost between different makes.
5. Various types of Electrical Appliances (domestic and commercial) available in the market, their specifications, different makes or manufacturing companies (minimum three), comparison of cost between different makes. (compare any one type)
6. Survey and study of house wiring accessories, manufacturers, rates, specifications, their literature collection for their design
7. Study of LT/HT components, detailed specifications from catalogues of manufacturers, drawings, rates, availability in local market

**Minor project assignments may also include following studies:**

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

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- 1.1 Fluorescent lamp/ tube
- 1.2 HP mercury vapour lamp
- 1.3 HP sodium vapour lamp
- 1.4 Compact Fluorescent lamp (CFL)
  
2. Study of induction furnace by visiting a factory and to prepare a report
  
3. Study of welding equipment along with its accessories
  
4. Study of the electroplating plant by visiting an industry and preparing a report
  
5. Study of refrigerator/air conditioner and to prepare a report of its electrical circuit
  
6. Study of an electric locomotive by visiting any locomotive repair shop at a nearby station

**NOTE:**The students of the class may be divided into five groups and work may be assigned to each group as per their interest.

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**ELECTRICAL MACHINES-II LAB (125507)**

**Credits- 01**

**L T P**

**0 0 2**

**LIST OF PRACTICALS**

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



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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**INDUSTRIAL ELECTRONICS AND CONTROL OF DRIVES LAB**  
**(125508)**

**Credits- 01**

**L T P**

**0 0 2**

**LIST OF PRACTICALS**

1. To draw V-I characteristics of an SCR
2. To draw V-I characteristics of a TRIAC
3. To draw V-I 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 Quadriac (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. Single phase controlled rectifier

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**DIGITAL ELECTRONICS AND MICROPROCESSORS LAB**  
**(122512)**

**Credits- 01**

**L T P**

**0 0 2**

**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
7. To verify the truth table for JK flip flop
8. Construction and of testing of any counter
2. Verification of operation of a 8-bit D/A Converter
3. Writing assembly language programme using numemoanics and test them on P Kit (any three)
  - 3.5.1 Addition of two 8-bit numbers
  - 3.5.2 Subtraction of two 8-bit numbers
  - 3.5.3 Multiplication of two 8-bit numbers
  - 3.5.4 Division of two 8-bit numbers
  - 3.5.5 Finding average of N given integer
  - 3.5.6 Finding maximum number out of three given numeric
4. Assembly language programming for different applications on 8051 microcontroller.

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**INDUSTRIAL TRAINING (125509)**

**Credits- 04**

**L T P**

**0 0 0**

**(AFTER 4<sup>TH</sup> SEM EXAMINATION)**

**INDUSTRIAL TRAINING**

Industrial Training aims at exposing the students to field practices, size and scale of operation and work culture at practical sites. For this purpose, students at the end of fourth semester are required to be sent for a period of 4 weeks to industry.

These students should be supervised and guided by respective subject teachers. Each teacher may guide a group of four to five students.

The teacher along with field supervisors will conduct performance assessment of students. The components of evaluation will include the following.

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

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**UTILIZATION OF ELECTRICAL ENERGY (125601)**

**Credits- 04**

**L T P**

**4 0 0**

**Course 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

**1. Illumination:**

- 1.33 Nature of light, visibility spectrum curve of relative sensitivity of human eye and wave length of light
- 1.34 Definition: Luminous flux, solid angle, luminous intensity, illumination, luminous efficiency, depreciation factor, coefficient of utilization, space to height ratio, reflection factor, glare, shadow, lux.
- 1.35 Laws of illumination – simple numericals
- 1.36 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, compact filament lamp(CFL).
- 1.37 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
- 1.38 Main requirements of proper lighting; absence of glare, contrast and shadow
- 1.39 General ideas about time switches, street lighting, flood lighting,

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monument lighting and decorative lighting, light characteristics etc.

**2. Electric Heating**

2.18 Advantages of electrical heating

36. 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 (construction and working of two appliances)

Microwave heating and its applications (construction and working of two appliances)

Solar Heating

37. Calculation of resistance heating elements (simple problems)

**3. Electric Welding:**

3.1 Advantages of electric welding

3.2 Welding method

3.2.1 Principles of resistance welding, types – spot, projection, seam and butt welding, welding equipment

3.2.2 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

**4. Electrolytic Processes:**

1.4 Need of electro-deposition

1.5 Laws of electrolysis, process of electro-deposition - clearing, operation, deposition of metals, polishing and buffing

1.6 Equipment and accessories for electroplating

1.7 Factors affecting electro-deposition

1.8 Principle of galvanizing and its applications

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- 1.9 Principles of anodizing and its applications
- 1.10 Electroplating of non-conducting materials
- 1.11 Manufacture of chemicals by electrolytic process

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

- 4. Principle of air conditioning, vapour pressure, refrigeration cycle, eco-friendly refrigerants
- 12. Description of Electrical circuit used in  
Refrigerator,  
Air-conditioner, and  
Water cooler

**6. Electric Drives:**

- 8.5 Advantages of electric drives
- 8.6 Characteristics of different mechanical loads
- 8.7 Types of motors used as electric drive
- 8.8 Electric braking
  - Plugging
  - Rheostatic braking
  - Regenerative braking
- 8.9 General idea about the methods of power transfer by direct coupling by using devices like belt drive, gears, chain drives etc.
- 8.10 Examples of selection of motors for different types of domestic loads
- 8.11 Selection of drive for applications such as general workshop, textile mill, paper mill, steel mill, printing press, crane and lift etc. Application of flywheel.
- 8.12 Specifications of commonly used motors e.g. squirrel cage motors, slip ring induction motors, AC series motors, Fractional kilo Watt(FKW) motors
- 8.13 Selection of motors for Domestic Appliances

**7. Electric Traction:**

- 7.1 Advantages of electric traction
- 7.2 Different systems of electric traction, DC and AC systems, diesel electric

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- system, types of services – urban, sub-urban, and main line and their speed-time curves
- 7.3 Different accessories for track electrification; such as overhead catenary wire, conductor rail system, current collector-pentagraph
  - 7.4 Factors affecting scheduled speed
  - 7.5 Electrical block diagram of an electric locomotive with description of various equipment and accessories used.
  - 7.6 Types of motors used for electric traction
  - 7.7 Power supply arrangements
  - 7.8 Starting and braking of electric locomotives
  - 7.9 Introduction to EMU and metro railways
  - 7.10 Train Lighting Scheme

**Note: Students should be taken for visits to nearest electrified railway track and railway station to study the electric traction system.**

**RECOMMENDED BOOKS**

- 5. Art and Science of Utilization of Electrical Energy by H Partap, Dhanpat Rai & Sons, Delhi
- 6. Utilization of Electrical Energy by JB Gupta, Kataria Publications, Ludhiana
- 7. Utilization of Electrical Energy by Sahdev, Uneek Publication, Jalandhar
- 8. A Text Book. of Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi
- 9. Modern Electric Traction by H Partap, Dhanpat Rai & Sons, Delhi
- 10. Utilization of Electrical Energy by OS Taylor, Pitman Publications
- 11. Generation, Distribution and Utilization if Electrical Power by CL Wadhwa, Wiley Eastern Ltd., New Delhi
- 12. Utilization of Electrical Energy by G.L. Marwaha; Eagle Prakashan Jalandher

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**PROGRAMMABLE LOGIC CONTROLLERS & MICRO CONTROLLERS**  
**(122612)**

Credits- 05

L T P

5 0 0

**Course 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.

**1. 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.

**2. Working of PLC**

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

**3. Instruction Set**

- 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



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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

**4. Ladder Diagram Programming**

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

**5. 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

**6. Micro Controller Series (MCS)-51 Over View**

- Pin details
- I/o Port structure
- Memory Organisation
- Special function registers

**7. Instruction Set Addressing Modes**

- Timer operation
- Serial Port operation
- Interrupts

**8. Assembly language programming**

- Assemblers and Compilers
- Assembler Directives

**9. Design and Interface**

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

**10. Introduction of PIC Micro controllers**

**11. Application of Micro controllers**

**RECOMMENDED BOOKS**

- 1) Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA
- 3.4 Introduction to PLCs by Gary Dunning. McGraw Hill
- 3.5 Module on PLCs and their Applications by Rajesh Kumar, NITTTR Chandigarh
- 3.6 Programmable Logic Controller and Microcontrollers by Gurpreet Kaur and SK Sahdev by Uneek Publications, Jalandhar
- 3.7 Module on “Allen Bradlag PIC (SLC 500), Institution set-1, by Rajesh Kumar, NITTTR, Chandigarh
- 3.8 Module on “PLC Applications based on SLC 5/03” By Rajesh Kumar, NITTTR Chandigarh
- 3.9 The 8051 Micro controller by 1 Scot Mackenzie, Prentice Hall International, London
- 3.10 The 8051 Micro controllers Architecture, programming and Applications by Ayala; Penram International
- 3.11 Process Control Instrumentation Technology by Johnson, Curits; EE Edition, Prentice Hall of India, New Delhi
- 3.12 Microcontrollers by Ayala
- 3.13 Microcontrollers by Mazidi
- 3.14 Microcontrollers by Neil Makanzie
- 3.15 Microcontrollers by Deshmukh
- 3.16 PLC & Microcontrollers by Deepak Arora; Eagle Prakashan Jalandher

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**ELECTRICAL POWER-II (125602)**

**Credits- 04**

**L T P**

**4 0 0**

**Course 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.

**1. Faults:**

Common type of faults in both overhead and underground systems, symmetrical/ unsymmetrical faults. Single line to ground fault, double line to ground fault, 3-phase to ground fault open circuit , simple problems relating to fault finding.

**2. Switch Gears**

3.5 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)

3.6 Principles of Arc extinction in OCB and ACB, Constructional features of OCB, ACB, and their working,

3.7 Circuit breakers. Types of circuit breakers, bulk and minimum oil circuit breakers, air blast circuit breakers, SF<sub>6</sub> circuit breakers

3.8 Miniature circuit breakers ACB, ELCB, MCB, for distribution and transmission system (Descriptive)

**3. Protection Devices**

3.9 Fuses; function of fuse. Types of fuses, HV and LV fuses, rewire-able, cartridge, HRC

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3.10 Earthing: purpose of earthing, method of earthing, Equipment earthing, Substation earthing, system earthing as per Indian Electricity rules. Methods of reducing earth resistance.

6.14 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

**4. Protection Scheme**

4.1 Relays for generator protection

4.2 Relays for transformer, protection including Buchholtz relay protection

4.3 Protection of feeders and bus bars, Over current and earth fault protection.

4.4 Distance protection for transmission system

4.5 Relays for motor protection

**5. Over-voltage Protection**

5.1 Protection of system against over voltages, causes of over voltages, utility of ground wire

5.2 Lightning arrestors, rod gap, horn gap, metal oxide type.

5.3 Transmission Line and substation protection against over-voltages and lightning

**6. Various Types of Tariffs:**

6.1 Concept of Tariffs

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

6.3 Simple problems

**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**

30. Testing, Commissioning , Operation and Maintenance of Electrical Equipment by S Rao, Khanna Technical Publication, New Delhi

31. Electrical Power – II by SK Sahdev, Uneek Publications, Jalandhar (Pb)

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

32. Electrical Power Systems by CL Wadhwa, Wiley Eastern Ltd., New Delhi
33. Textbook of Electrical Technology by BL Theraja, S Chand and Co., New Delhi
34. Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi
35. A Course in Electrical Power by ML Soni, PV Gupta and Bhatnagar, Dhanpat Rai & Sons, New Delhi
36. Principles of Power Systems by VK Mehta, S Chand and Co., New Delhi
37. Preventive Maintenance of Electrical Apparatus by SK Sharotri, Katson Publishing House, Ludhiana
38. Electrical Power by Marwaha; Eagle Prakashan Jalandher

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**Elective – II**

**(a) MODERN ELECTRIC TRACTION (125603)**

**Credits- 03**

**L T P**

**3 0 0**

**Course Objective**

Now a days electrical energy finds one of its major application is in electric traction besides diesel electric locomotives. An electrical engineering diploma holder is required to have elementary knowledge of electric drives and systems used in traction and their accelerating and braking arrangements. This subject deals with the modern electric traction systems and practices.

**1. Introduction**

- 1.1. Electric Traction System.
- 1.2. Historical background of track electrification in India.
- 1.3. Advantages over other system
- 1.4. Types of electric traction systems
- 1.5. Choice of traction system in India

**2. System of Track Electrification**

- 2.4 Single phase low frequency system.
- 2.5 Three phase low frequency system
- 2.6 Composite System
- 2.7 Disadvantages of Single phase to D.C. System
- 2.8 Comparison between pure A.C. and D.C system.

**3. Track Mechanics**

- 2.3.12 Types of services (Urban, Suburban and Mainline)
- 2.3.13 Speed time curve
- 2.3.14 Tractive effort and traction effort speed characteristics
- 2.3.15 Power of traction motor
- 2.3.16 Specific energy consumption

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

- 2.3.17 Mechanics of train movement, co-efficient
  - 2.21 Factors affecting slip.
  - 2.22 Simple numerical problems.
- 4. Power Supply arrangement**
- 4.6 Constituents of Power supply system i.e. substation
  - 4.7 Sectioning and paralleling post.
  - 4.8 Subsection and post
  - 4.9 Sub-sectioning post and elementary sections
  - 4.10 Major control posts or switching substations
  - 4.11 Major equipment of substations.
- 5. Equipment used in and outside the Locomotive**
- 5.1.4 Block diagram of a Locomotive
  - 5.1.5 Overhead equipment
  - 5.1.6 Section Insulator
  - 5.1.7 Polygon OHE
  - 5.1.8 Supporting structure
  - 5.1.9 Current collector
  - 5.1.10 Circuit breaker
  - 5.1.11 Tap changer
  - 5.1.12 Transformer
  - 5.1.13 Rectifier connections
  - 5.1.14 Smoothing reactors
- 6. Traction Motors and Traction Motor Control**
- 5.3 Desirable characteristic of traction motors.
  - 5.4 Comparative study of characteristic of Induction motors and d.c. series motors
  - 5.5 Linear induction motors and their suitability for traction applications.
  - 5.6 Series parallel control of traction motors.
  - 5.7 Advantages of series parallel control
  - 5.8 Simple numerical problems

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**7. Braking**

5. Requirements of braking system.
6. Types of brakes (Mechanical, hydraulic, magnetic and eddy current)
17. Electrical braking – plugging, rheostatic and regenerative braking.

**8. Train Lighting**

- 8.1 Systems of train lighting
- 8.2 Special requirements of train lighting
- 8.3 Single Battery system
- 8.4 Double Battery parallel block systems
- 8.5 Principal equipment of Double Battery system
- 8.6 Modified Train Lighting System
- 8.7 Silicon Blocker Rectifier
- 8.8 End on generation.

**9. Railway Coach Air-conditioning**

- 1.4 Electrical equipment for power generation and accessories for control of air conditioning equipment.  
Motor generator set  
Star-delta starter and pre-cooling plug socket  
Compressor – condenser and air conditioning unit  
motors Main control panel.  
Batteries
- 1.5 Circuit explanation of schematic diagram for air conditioning equipment.
- 1.6 Starting of plant when coach is stationary and no ac supply is available.
- 1.7 Starting the plant when coach is running and the generator is generating.

**INSTRUCTIONAL STRATEGY**

Since the subject is field oriented and there is no laboratory arrangement in polytechnics, the students should be taken to locomotive yard, railway workshops and shown the actual working of the system.

**RECOMMENDED BOOKS**



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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

- 3.4 Art and Science of utilization of electrical energy by H. Partab, Dhanpat Rai and Sons, Delhi
- 3.5 Modern Electric Traction by Partab, Dhanpat Rai and Sons, Delhi
- 4.5 Modern Electric Traction by I.S. Bhullar; Eagle Prakashan Jalandher

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**Elective-II**

**(b) ENERGY MANAGEMENT (125604)**

**Credits- 03**

**L T P**

**3 0 0**

**Course 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.

**1. Energy Management**

- 5.3 Overview of energy management, need for energy conservation, Environmental Aspects
- 5.4 Need for energy conservation with brief description of oil and coal crisis.
- 5.5 Environmental aspects
- 5.6 Alternative sources of energy.
- 5.6 Energy efficiency- its significance

**2. Energy Conservation**

- 4. Energy conservation in Domestic sector- Lighting, home appliances
- 5. Energy conservation in Industrial sector- Motors, Industrial lighting, Distribution system, Pumps, Fans, Blowers etc.,
- 6. Energy conservation in Agriculture sector Tubewell pumps, diesel-generating sets, Standby energy sources.
- 7. Macro Level approach for energy conservation at design stage.

**3. Energy Efficient Devices**

- 9. Energy efficient technology an overview
- 10. Need for energy efficient devices
- 5 Initial cost versus life cycle, cost analysis on life cycle basis
- 6 Energy efficient motors as compared to standard motors.
- 7 BIS specification for energy efficient motors, salient design features,
- 8 Efficiency as a function of load, safety margins
- 9 Energy efficient lighting system different sources, lumens/watt, LEDs, role of voltage on efficiency

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

3.7 Distribution system- Optimum cable size, amorphous core transformer, role of power factor, use of compensating capacitors-manual and automatic, location of capacitors.

**4. Energy Audit**

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

**5. Environmental Impact Assessment**

- 5.1 Need for environmental impact assessment
- 5.2 Standard format for assessment and its completion
- 5.3 Evaluation of the assessment.

**INSTRUCTIONAL STRATEGY**

While explaining the need and energy management, the teacher should give students home assignments bases on energy conservation. The students should be made familiar with the energy efficient devices, various approaches to conserve energy, energy auditing procedure etc. Beet learning will take place if students are given real life problems on energy audit.

**RECOMMENDED BOOKS:**

- 6. Manual on Energy Efficiency at Design Stage, CII Energy Management Cell.
- 7. Manual on Energy Efficiency in Pumping System, CII Energy Management Cell.
- 8. Manual on Variable Speed Drives for Energy Efficiency CII Energy Management Cell.
- 9. Energy Conservation-case studies in ceramic industry, sugar industry, fertiliser industry, cement industry. CII, Energy Management Cell etc
- 10. Energy Management; Eagle Prakashan Jalandher

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**BASICS OF MANAGEMENT (120601)**

**Credits- 05**

**L T P**

**5 0 0**

**Course 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.

**1. Principles of Management**

- 1.1. Introduction, definition and importance of management.
- 1.2. Functions of Management  
Planning, Organizing, Staffing, Coordinating, Directing, Motivating and Controlling
- 1.3. Concept and Structure of an organization  
Types of industrial organization
  - a) Line organization
  - b) Functional organization
  - c) Line and Functional organization
- 1.4. Hierarchical Management Structure  
Top, middle and lower level management
- 1.5. Departmentalization  
Introduction and its advantages.

**2. Work Culture**

3. Introduction and importance of Healthy Work Culture in organization
4. Components of Culture
5. Importance of attitude, values and behavior  
Behavioural Science – Individual and group behaviour
- 5.6 Professional ethics – Concept and need of Professional Ethics

**3. Leadership and Motivation**

- 5.5.3 Leadership  
Definition and Need of Leadership

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Qualities of a good leader  
Manager vs. leader

5.5.4 Motivation

Definition and characteristics of motivation  
Factors affecting motivation  
Maslow's Need Hierarchy Theory of Motivation

5.5.5 Job Satisfaction

**4. Legal Aspects of Business: Introduction and need**

4.1. Labour Welfare Schemes

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

4.2. Factory Act 1948

4.3. Minimum Wages Act 1948

**5. Management Scope in different Areas**

4. Human Resource Development

Introduction and objective  
Manpower Planning, recruitment and selection  
Performance appraisal methods

5. Material and Store Management

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

6. Marketing and Sales

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

13. Financial Management – Introduction

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

5.5 Maintenance Management

- a) Concept
- b) Preventive Maintenance

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**6. Miscellaneous topics**

2. Customer Relationship Management (CRM)  
Definition and Need  
Types of CRM  
Customer satisfaction
3. Total Quality Management (TQM)  
Inspection and Quality Control  
Concept of Quality Assurance  
TQM
4. Intellectual Property Rights ( IPR)  
Introduction, definition and its importance  
Infringements related to patents, copyright, trade mark

**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
12. Customer Relation Management, Sugandhi RK, Oscar Publication, Delhi.

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**MAJOR PROJECT WORK (125605)**

**Credits- 02**

**L T P**

**0 0 4**

**Course 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
- g) Projects related to wastage reduction
- h) 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.

**NOTE: Any one from each section:**

**SECTION A**

**1.1 Electrical Machines and Equipment:**

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- 1.1.1 Design and Construction of a small transformer (100 VA to 1 kVA)
- 1.1.2 Construction of hot air blower
- 1.1.3 Design and Fabrication of Automatic curtain operator
- 1.1.4 Fabrication of Automatic Star-Delta starter
- 1.1.5 Construction of Automatic Water level controller
- 1.1.6 Construction of Choke for fluorescent tubes
- 1.1.7 Design and construction of fan regulators (inductance type)
- 1.1.8 Design and construction of fan regulators (Resistance type)
- 1.1.9 Design and construction of loading rheostats
- 1.1.10 Design and construction of Desert coolers/room coolers
- 1.1.11 Rewinding of single phase Electric Motor up to 1 HP
- 1.1.12 Rewinding of motors of 3 phase upto 5 HP
- 1.1.13 Design and construction of Geyser
- 1.1.14 Rewinding of motors of small domestic appliances(exhaust fan/ceiling fan)
- 1.1.15 Erection/installation and commissioning of rotating electrical machine
- 1.1.16 Fault detection and repair of electrical/electronic instruments
- 1.1.17 Design and assembly of contactor control circuit for various applications

**SECTION B**

**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.
- 1.2.2 Drawing, estimating and costing of electrical installation of a workshop having a given number of electrically operated appliances/machines.
- 1.2.3 To study the laying of underground distribution cable for a small colony starting from main distribution pole
- 1.2.4 To study the erection 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.
- 1.2.5 Energy audit for the workshop of your institution and to suggest remedies to have low Electricity Bill
- 1.2.6 To provide a service connection to a consumer's premises for domestic purposes
- 1.2.7 To survey the load of given area in a village, small colony, calculate the effective load and find out the sizes of the cables/conductors for the



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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

proposed distribution system

- 1.2.8 Designing of light and fan scheme for a institutional or commercial building
- 1.2.9 To study the augmentation of a nearby pole mounted sub station
- 1.2.10 To prepare a proposal for substation of your institution, calculating the total load (estimating and costing)

### **SECTION C**

#### **1.3 Electronics 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 and 7806, 7906
- 1.3.7 Automatic battery charger using SCR
- 1.3.8 Digital Clock
- 1.3.9 FM Radio Receiver
- 1.3.10 Burglar Alarm
- 1.3.11 Fabrication of UPS
- 1.3.12 Automatic street light/dressing table light
- 1.3.13 Mosquito Repeller
- 1.3.14 Inverter circuit 500 watt/1 KVA.
- 1.3.15 Solid State Control of Traffic Lights

### **SECTION D**

#### **1.4 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
10. SCR based speed controller for DC shunt motor
11. Three phase full wave rectifier using power diodes
12. Timer circuit using 555-IC
13. SCR controlled rectifier circuit
14. Speed control circuit of DC shunt motor using SCR
15. Inverting and non-inverting amplifiers using OP AMP(741)
16. Comparator circuits using OP AMP (741)
17. Project using PLC

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18. Project relating to Microprocessor
19. Project relating to Microcontroller

**Note:** The quality of end-product and process adopted by the students in its execution should be taken into consideration along with other parameters while evaluating the students

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**PROGRAMMABLE LOGIC CONTROLLERS & MICRO CONTROLLERS**  
**LAB (122613)**

Credits- 01

L T P

0 0 2

**LIST OF PRACTICALS**

**PLCs**

- 1.5 Components/sub-components of a PLC, Learning functions of different modules of a PLC system
- 1.6 Practical steps in programming a PLC (a) using a Hand held programmer (b) using computer interface
- 1.7 Introduction to step 5 programming language, ladder diagram concepts, instruction list syntax
- 1.8 Basic logic operations, AND, OR, NOT functions
- 1.9 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**

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

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**DIPLOMA IN ELECTRICAL ENGINEERING (CODE:25)**

**ELECTRICAL POWER-II LAB (125606)**

**Credits- 01**

**L T P**

**0 0 2**

**LIST OF PRACTICALS**

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

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