ELECTRICAL ENGINEERING

(For Punjab State)

VARIOUS SUBJECTS IN SECOND YEAR

THIRD SEMESTER

3.1 FUNDAMENTALS OF ELECTRICAL ENGINEERING

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RATIONALE

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

DETAILED CONTENTS

1. (a) Application and Advantages of Electrical Energy (4 Hrs)

- Different forms of energy
- Advantages of electrical energy
- Uses of electrical energy

(b) 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 (10 Hrs)

2.1 Ohm's law, resistances in series and parallel

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

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

2.4 Star-delta transformation

3. Batteries (10 Hrs)

3.1 Basic idea about primary and secondary cells

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

3.3 Charging methods used for lead acid accumulator

3.4 Care and maintenance of a lead acid battery

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

4. Magnetism and Electromagnetism: (7 Hrs)

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

4.2 Force on a conductor placed in the magnetic field

4.3 Series magnetic circuits, simple problems

4.4 Concept of hyteresis, loop and hysteresis loss.

5.. Electromagnetic Induction: (8 Hrs)

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 (5 Hrs)

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 (12 Hrs)

7.1. 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 Hrs)

8.1 Advantages of 3 phase over single phase system
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.

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 $R_t = R_1+R_2+\ldots$ where R_1, R_2 etc. are resistances connected in series

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

Where R_1, R_2 etc. are resistances connected in parallel

3. Verification of Kirchhoff's current and voltage laws applied to DC circuits
a) to construct a circuit arrangement consisting of resistances in series, parallel combination
b) identification of node points in the circuit
c) to see that algebraic sum of currents at node point is zero
d) to see that algebraic sum of emfs and voltage drops in a closed loop is zero

4. To 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

6. To construct an RL and RC circuit and to measure
   a) their impedance
   b) phase angle between voltage and current
   c) construct impedance triangle

7. 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

8. Measurement of power and power factor of a single phase RLC circuit. To calculate KVA and KVAR

9. Measurement of power and power factor of a 3-phase circuit by using 2- wattmeter method using induction motor as a load and to calculate KVA and KVAR

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

Note: The results should be verified analytically also.

INSTRUCTIONAL STRATEGY

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

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

8. Basic Electrical Engineering by Mool Singh, Galgotia Publication Pvt. Ltd., New Delhi

9. Principles of Electrical Engineering by BR Gupta, S Chand & Co., New Delhi

10. Handbook of Electrical Engineering by SL Bhatia, Khanna Publishers, New Delhi

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No	Topic	Time Allotted (Hrs)	Marks Allocation (%)
1	Application and advantages of electrical energy	04	5
2	DC Circuits	10	15
3	Batteries	10	15
4	Magnetism and Electromagnetism	07	10
5	Electromagnetic Induction	08	15
6	AC Fundamentals	05	5
7	AC Circuits	12	20
8	Poly-Phase systems	08	15
	Total	**64**	**100**

3.2 ELECTRONICS - I

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RATIONALE

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.

DETAILED CONTENTS

1. Introduction (5 hrs)

   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 (10 hrs)

   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 (10 hrs)

   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

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

4. Bi-polar Transistors (7 hrs)

4.1 Concept of junction transistor, PNP and NPN transistors, their symbols and mechanism of current flow
4.2 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 (8 hrs)

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

6. Single-Stage Transistor Amplifiers (10 hrs)

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 hrs)

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, 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) (07 hrs)

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

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) Π filter circuits
7. Plotting input and output characteristics of a transistor in CB configuration
8. Plotting input and output characteristics of a transistor in CE configuration
9. Measurement of operating point in case of (i) fixed biased circuit (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

INSTRUCTIONAL STRATEGY

This subject gives the knowledge of fundamental concepts of basic electronics. The teacher should give emphasis on understanding of concepts and various term used in the subject. The students be made familiar with diodes, transistors, resistors, capacitors, inductors etc. and

electrical measuring instruments etc. Practical exercises will reinforce various concepts. Application of Semiconductor Diodes, Transistors, Field Effect Transistors etc must be told to students.

RECOMMENDED BOOKS

1. Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi.
2. Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New Delhi
3. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
4. Electronic Components and Materials by SM Dhir, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi.
5. Principles of Electronics by SK Bhattacharya and Renu Vig, SK Kataria and Sons, Delhi
6. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.
7. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill Education Pvt Ltd, New Delhi.
8. Basic Electronics – Problems and Solutions by Albert Malvino and David J. Bates; Tata McGraw Hill Education Pvt Ltd, New Delhi.
9. Basic Electronics by J.S. Katre, Sandeep Bajaj, Tech. Max. Publications, Pune.
10. Analog Electronics by DR Arora, Ishan Publications, Ambala City.
11. Analog Electronics by JC Karhara, King India Publication, New Delhi
12. Electrical Devices and Circuits by Rama Reddy, Narosa Pulishing House Pvt. Ltd., New Delhi
13. 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
14. Basic Electronics by JB Gupta, SK Kataria and Sons, New Delhi
15. Grob's Basic Electronics- A text Lab Manual (Special Indian Edition) by Schultz, Tata McGraw Hill Education Pvt Ltd, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No	Topic	Time Allotted (Hrs)	Marks Allocation (%)
1	Introduction	5	10
2	Semi-conductor Theory	10	15
3	Semiconductor Diodes	10	15
4	Bi-polar Transistors	7	10
5	Transistor Biasing and Stabilization	8	15
6	Single-Stage Transistor Amplifiers	10	15
7	Multi-Stage Transistor Amplifiers	7	10
8	Field Effect Transistor	7	10
	Total	**64**	**100**

3.3 ELECTRICAL AND ELECTRONICS ENGINEERING MATERIALS

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RATIONALE

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

DETAILED CONTENTS

1. Classification: (3 Hrs)

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

2. Conducting Materials (12 Hrs)

   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

   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: Rresistivity, 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.

   Introduction to bundle conductors and its applications.

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

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 (2 Hrs)

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

4. Insulating materials; General Properties: (12 Hrs)

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: (16 Hrs)

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

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

5.3 Gaseous materials; Air, Hydrogen, Nitrogen, SF_6 their properties and applications

6. Magnetic Materials: (11 Hrs)

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 (4 hrs)
Thermocouple, bimetals, leads soldering and fuses material, mention their applications

8. Introduction of various engineering materials necessary for fabrication of electrical machines such as motors, generators, transformers etc (4 hrs)

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

1. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi
2. Electronic Components and Materials by Grover and Jamwal, Dhanpat Rai and Co., New Delhi
3. Electrical Engineering Materials by Sahdev, Unique International Publications
4. Electronic Components and Materials by SM Dhir, Tata Mc Graw Hill, New Delhi
5. Electrical Engineering Materials by PL Kapoor, Khanna Publishers, New Delhi
6. Electrical and Electronics Engineering Materials BR Sharma and Others, Satya Parkashan, New Delhi
7. Electrical and Electronics Engineering Materials DR Arora, Ishan Publications, Ambala City
8. Electrical Engineering Materials by Rakesh Dogra, SK Kataria and Sons, NEW Delhi

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPERSETTER

Sr. No	Topic	Time Allotted (Hrs)	Marks Allocation (%)
1	Classification	3	5
2	Conducting Materials	12	20
3	Review of Semi-conducting Materials	2	5
4	Insulating materials; General Properties:	12	20
5	Insulating Materials and their Applications	16	25
6	Magnetic Materials:	11	15
7	Special Materials	4	5
8	Introduction of various Engineering Materials	4	5
	Total	**64**	**100**

3.4 COMPUTER PROGRAMMING AND APPLICATIONS (For Electrical Engineering)

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RATIONALE

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.

DETAILED CONTENTS

1. Algorithm and Program Development (4 hrs)

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

2. Program Structure (C Programming) (24 hrs)

   History of 'C', data types, input output statements, arithmetic and logical operations, data assignments, precedence and associatively

   I/O statements

   Assignment, Variables, arithmetic operation- their precedence, data types standard I/O function, formulated I/O

   Control Statements

   Logical and relational operators; if-else, while, do- while, for loops, breaks, switch statements

   Functions:

   Function declaration, parameter passing- by value, storage classes (Local, Global and Static variables), standard library functions

   Arrays:

   Single and multi dimensional arrays, character arrays

   Pointers:

   To various data types, pointers in parameters passing, pointers to function

Structures:

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

Strings:

String processing, functions and standard library function

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 (4 hrs)

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

LIST OF PRACTICALS

Programming exercise on executing a C Programs.

Programming exercise on editing a C program.

Programming exercise on defining variables and assigning values to variables

Programming exercise on arithmetic and relation operators

Programming exercise on arithmetic expressions and their evaluation

Programming exercise on reading a character

Programming exercise on writing a character

Programming exercise on formatting input using print

Programming exercise on formatting output using scan

Programming exercise on simple IF statement

Programming exercise on IF… ELSE statement

Programming exercise on SWITCH statement

Programming exercise on GOTO statement

Programming exercise on DO-WHILE statement

Programming exercise on FOR statement

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

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

Programming in C by Schaum series McGraw Hill

Programming in C by Kerning Lan and Richie; Prentice Hall of India, New Delhi

Programming in C by Balagurusamy, Tata McGraw Hill,Education Pvt Ltd. New Delhi.

Let us C- Yashwant Kanetkar, BPB Publications, New Delhi

Vijay Mukhi Series for C and C++

Programming in C by R Subburaj, Vikas Publishhing House Pvt. Ltd., Jangpura, New Delhi

Programming in C by Kris A Jansa, Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi

Programming in C by BP Mahapatra, Khanna Publishers, New Delhi

Elements of C by MH Lewin, Khanna Publishers, New Delhi

The Complete Reference to Visual Basic 6, by Noel Jerke, Tata McGraw Hill, New Delhi

Web site www.Beyondlogic.org

Pointers in C by Yashwant Kanetkar, BPB Publishers New Delhi

Programming in Applications by Chandershekhar, Uneek Publications, Jalandhar

The essentials of Computer Organizing and Architecture by Linda Null and Julia Labur, Narosa Publishing House Pvt. Ltd., New Delhi

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Algorithm and Program Development	4	15
2.	Program Structure (C Programming)	24	70
3.	Software Applications	4	15
Total		**32**	**100**

3.5 ELECTRICAL ENGINEERING DESIGN AND DRAWING

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RATIONALE

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

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

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

DETAILED CONTENTS (To make 16 Sheets)

1. Symbols and Signs Conventions **(2 Sheets)** (4 hrs)

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

2. Panels/Distribution Boards **(3 Sheets)** (18 hrs)
   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)** (22 hrs)

   - 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)** (26 hrs)

   - 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)** (18 hrs)

   - 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.

INSTRUCTIONAL STRATEGY

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

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPERSETTER

Sr. No	Topic	Time Allotted (Hrs)	Marks Allocation (%)
1	Symbols and Signs Conventions	6	10
2	Design and Drawing of panels	18	20
3	Orthographic projections of simple electrical parts	26	25
4	Drawing of Machine Parts	26	25
5	Contactor Control Circuits	20	20
	Total	**64**	**100**

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

3.6 ELECTRICAL WORKSHOP PRACTICE - I

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RATIONALE

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

DETAILED CONTENTS

1. Study of electrical safety measures 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

Types of wiring and to make different light control circuits in the following types of wiring.

Casing and capping (PVC) wiring.

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) Types of wiring and to make different light control circuits in the following types of wiring:
   - 4.1 Casing and Capping (PVC) wiring
   - 4.2 Conduit wiring (surface/concealed)

5. Contruction/assembly of Distribution Board and Extension Board

(a) Construction of an extension board with two 5A sockets and one I5A 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.
Wiring of main distribution board with four outgoing circuits for light and fan loads including main switch and fuses (only internal connection)

6. Simple light and Alarm Circuits(any four)

   One lamp controlled by two switches (staircase circuit)
   Two lamps controlled by three switches (double staircase circuit)
   Two ordinary bells (for day and night) used at a distant residence
   Bell response circuit using one bell and one relay
   Bell response circuit of an office (for three rooms)
   Traffic light control system for two roads crossing.

   Wiring of a switch board containing at least two switches, one fan regulator and one 5/15A socket controlled by their respective switches using piano type switches and matching socket

7. Wiring of a series test lamp board and to use it for finding out simple faults

8. Testing of domestic wiring installation using meggar

9. Fault finding and repair of a tube light circuit

10. Wiring and testing of alarm and indicating circuits using relay, push buttons and bells (simple single phase circuits)

11. Assembly of distribution board/ panel using MCB, main switch, changeover switch and ELCB etc.