

3.1 BASICS OF ELECTRICAL ENGINEERING AND MACHINERY

L T P
Periods/week 4 -1- 4

DETAILED CONTENTS

Unit:- I (08 periods)

Overview of DC Circuits

Applications of Kirchoff's Laws in solving electrical network problems. Networks theorem such as: Superposition, Thevenin theorem, Norton theorem and maximum power transfer theorem.

Unit:- II (10 periods)

AC fundamentals

Concept of alternating current, and voltage, equation of instantaneous values. Representation of alternating sinusoidal quantities by phasors. Power in pure Resistance, Inductance, Capacitance. RL, RC, RLC circuits. Active and reactive components of current and their significance. Power factor and its practical significance. Resonance in series and parallel circuits. Active power, reactive power, apparent power

Unit:- III (10 periods)

Three phase supply

Advantage of three phase system over single phase system. Star–delta connection and transformation. Relation between phase voltage and line voltage, also between phase current and line current in a 3 phase system. Power and power factor in 3 phase system

Unit:- IV (10 periods)

Transformer

Working principle of a Transformer, constructional features. Voltage and current transformation. Auto transformer and its uses. Instruments transformer, voltage regulation and its significance. Need for isolation, Losses in a transformer, cooling of transformer

Unit:- V (16 periods)

Electrical Machines

Construction & Working Principle of DC Machines: DC motor, Single Phase Induction Motor. Three Phase Induction Motor. Three Phase Synchronous Machines: Alternator and synchronous motor.

Unit:- VI (10 periods)

Batteries

Basic idea about primary and secondary cells, Construction, working and application of Lead-Acid, Nickel-Cadmium Battery. Capacity and efficiency of lead acid battery. Charging methods used for lead-acid battery(accumulator), Care and maintenance of lead-acid battery, Series and parallel connections of batteries.

LIST OF PRACTICALS

1. Familiarization of measuring instruments viz. voltmeter, ammeter, and wattmeter.
2. To verify KVL in DC circuits.
3. To verify KCL in DC circuits.
4. To verify Thevenin's theorem in D.C. circuits.
5. To verify Norton's theorem in D.C. circuits.
6. To verify Super position theorem in D.C. circuits.
7. To verify Maximum power transfer theorem in D.C. circuits.
8. To determine effect of a single phase transformer from the data obtained through open circuit and short circuit test.
9. To test a lead – acid storage battery for charged & discharged condition.

RECOMMENDED BOOKS

1. Basic Electrical and Electronics Engineering by SK Sahdev ,Dhanpat Rai and CO, New Delhi.
2. Electrical Science by Choudhury S; Narosa Publishing House Pvt. Ltd. Daryaganj New Delhi.
3. Basic Electrical and Electronics Engineering by Kumar KM , Vikas Publishing House Pvt Ltd. Jangpura, New Delhi.
4. Basic Electrical Engineering by Mool Singh ,Galgotia Publication Pvt. Ltd. New Delhi.
5. Electrical Technology by BL Theraja, S Chand and Co, New Delhi.
6. Principles of Electrical Engineering by BR Gupta, S Chand and Co, New Delhi.
7. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill , New Delhi.
8. Basic Electrical Engineering by JB Gupta; SK Kataria and Sons, New Delhi.
9. Electrical Machine by SK Bhattacharya , Tata McGraw Hill, New Delhi.
10. Electrical Machine by SK Sahdev , Unique International Publications, Jalandhar.
11. Electrical Machine by Nagrath and Kothari, Tata McGraw Hill, New Delhi.
12. Electrical Engineering by JB Gupta, SK Kataria & Sons , New Delhi.
13. Electrical Machines by P. S. Bhimbra.

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (period)	Marks Allocation (%)
I	8	12
II	10	16
III	10	16
IV	10	16
V	16	24
VI	10	16
Total	64	100

3.2 ANALOG ELECTRONICS

L T P
Periods/week 4 1 4

DETAILED CONTENTS

Unit:- I (16 periods)

Semi Conductor Diode

P and N type semiconductors and their conductivity. Effect of temperature on conductivity of intrinsic semi conductor. PN junction diode, mechanism of current flow in PN junction, Drift and diffusion current, depletion layer, forward and reverse biased PN junction, potential barrier, concept of junction capacitance in forward and reverse bias condition. V-I characteristics, static and dynamic resistance . Diode as half wave, full wave and bridge rectifier. PIV, rectification efficiencies and ripple factor. Zener and avalanche breakdown, Working of Zener diode, Zener diode as a voltage regulator

Unit:- II (16 periods)

Introduction to Bipolar Transistor

Concept of bipolar transistor, structure. PNP and NPN transistor, their symbols and mechanism of current flow. Current relations in transistor; concept of leakage current. CB, CE, CC configuration of the transistor. Input and output characteristics in CB and CE configurations. Transistor as a switch.

Unit:- III (08 periods)

Transistor Biasing Circuits

Concept of transistor biasing and selection of operating point. Need for stabilization of operating point. Different types of biasing circuits.

Unit:- IV (08 periods)

Single Stage Transistor Amplifier

Classification of Amplifier. Single stage transistor amplifier circuits.

Unit:- V (16 periods)

FET, MOSFET & UJT

Construction, operation and characteristics of JFET and its application. Construction, operation and characteristics of MOSFET in depletion and enhancement modes and its applications. C-MOS advantages and applications

LIST OF PRACTICALS

1. Familiarization, identification and testing of active and passive components.
2. Familiarization with operations of different Electronics instruments like analog & digital Multi-meter, CRO, Signal generator, Regulated Power Supply
3. To plot V-I characteristics of PN Junction diode
4. To plot V-I characteristics of a Zener diode & observe its use as voltage regulator
5. To observe the wave shape of following rectifier circuit
 - Half wave rectifier
 - Full wave rectifier
 - Bridge rectifier
6. To plot the wave shape of full wave rectifier with
 - Shunt capacitor filter
 - Series capacitor filter
7. To plot input and output characteristics and calculate parameter of transistor in CE configuration
8. To plot input and output characteristics and calculate parameter of transistor in CB configuration
9. To plot V-I characteristics of FET Transistor

RECOMMENDED BOOKS

1. Basic Electronics and Linear circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill, New Delhi.
2. Electronics Devices and circuits by D.C. Kulshreshtha; New Age Publishers, New Delhi.
3. Principle of Electrical and Electronics Engineering by VK Mehta; S Chand and Co. New Delhi.
4. Electronics Components and Materials by SM Dhi, Tata McGraw Hill, New Delhi.
5. Electronics Device and circuits by Millman and Halkias; McGraw Hill.
6. Principle of Electronics by Albert Paul Malvino; Tata McGraw Hill.
7. Electronics Devices and circuits-I by Naresh Gupta, JyoteshMalhotra and Harish CSaini, Eagle Prakashan, Jalandhar.
8. Electronics Devices .and circuits by Rama Reddy, Narosa Publishing House Pvt.Ltd. New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (period)	Marks Allocation(%)
I	16	25
II	16	25
III	8	12
IV	8	13
V	16	25
Total	64	100

3.3 DIGITAL ELECTRONICS

L T P
Periods/week 4 1 4

RATIONALE

This syllabus has been designed to make the students know about the fundamental principles of digital electronics and gain familiarity with the available IC chips. This subject aims to give a background in the broad field of digital systems design and microprocessors.

DETAILED CONTENTS

Unit:- I (12 periods)

Number System And Codes

Introduction and advantages of Digital Signal over Analog Signals. Binary, octal, Decimal and hexadecimal number system & their conversion from one system to another. Binary addition, subtraction, 1's and 2's complement method of addition/subtraction Codes 8421, BCD, excess-3 and gray codes, ASCII code Signed representation of Binary numbers.

Unit:- II (12 periods)

Logic Gates and Families

- Concept of negative and positive logic
- Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EX-OR Gates, NAND and NOR as universal gates
- Logic family classification

Definition of SSI, MSI, LSI, VLSI. Classification of IC's on the basis of Technology (Unipolar, Bipolar etc.). TTL and C MOS families Characteristics of TTL and C MOS digital gates. Delay, speed, noise margin, logic levels, power dissipation, fan-in, fan-out, power supply requirement and Comparison between TTL and CMOS families

Unit:- III (10 periods)

Logic Simplification

Postulates of Boolean algebra, De Morgan's Theorems. Formulation of truth table and Boolean equation for simple problem. Implementation of Boolean (logic) equation with gates Concept of POS & SOP. Karnaugh map (upto 4 variables) including Don't care conditions.

Unit:- IV (10 periods)

Combinational Logic Circuits

Half adder and Full adder circuit, design and implementation. Half and Full subtracter circuit, design and implementation. 3-to-8 line decoder circuits. Introduction and Basic Functions of Multiplexers and De-Multiplexers

Unit:- V (12 periods)

Sequential Logic Circuits

Concept of Flip flop and Latch. Operation and truth tables of RS, T, D, and JK flip flops. Introduction to Counter (Asynchronous and Synchronous counters). 4 Bit Ripple Counter, Divide by N counter, Decade counter. Up/down counter Introduction and basic concepts of Shift Registers (shift left and shift right). Basic Idea of Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out Shift Register.

Unit:- VI (08 periods)

Memories And Converters

Memory organization, Classification of semi conductor memories. ROM, PROM, DROM, EPROM, EEPROM, RAM, CCD memories

LIST OF PRACTICALS

- 1) Verification and interpretation of truth tables for AND, OR, NOT, NAND, NOR and Exclusive OR (EX-OR) gates
- 2) Realization of logic functions with the help of NAND or NOR gates
- 3) To design a half adder & full adder using EX-OR and NAND gates and verification of its Truth Table.
- 4) To construct 3 bit binary to gray code and gray to binary converter Circuit.
- 5) Verification of truth table of D flip-flop, JK flip-flops)
- 6) Verification of truth table of Decoder ICs,
- 7) Verification of truth table of Multiplexer & De-Multiplexer.
- 8) Verification of truth table for BCD to seven segment display
- 9) Verification of truth table of 4 bit Binary Counter
- 10) Verify the operations of A/D and D/A convertor.

RECOMMENDED BOOKS

Note: Above experiments may preferably be done on Bread Boards.

1. Digital Electronics and Applications by Malvino Leach, Tata McGraw Hill Education Pvt Ltd, New Delhi.
2. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi.
3. Digital Electronics by Soumitra Kumar Mandal, Tata McGraw Hill Education Pvt Ltd.
4. Digital Electronics by V K Sangar , Raj Publishers, Jalandhar.
5. Digital Electronics by Tokheim, Tata McGraw Hill Education Pvt Ltd.
6. Digital Fundamentals by Thomas Floyds, Universal Book Stall.
7. Digital Electronics by RP Jain, Tata McGraw Hill Education Pvt Ltd, New Delhi.
8. Digital Electronics by KS Jamwal, DhanpatRai and Co., New Delhi.
9. Digital Electronics by Rajiv Sapra, Ishan Publication, Ambala
10. Digital Electronics by BR Gupta, DhanpatRai& Co., New Delhi.
11. Digital Systems, Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi.
12. Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi.
13. Fundamentals of Digital Electronics by Naresh Gupta, Jain Brothers, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (period)	Marks Allocation(%)
I	12	20
II	12	20
III	10	15
IV	10	15
V	12	20
VI	08	10
Total	64	100

3.4 ELECTRICAL AND ELECTRONICS ENGINEERING MATERIALS

L T P
Periods/week 4-0-4

RATIONALE

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

DETAILED CONTENTS

Unit:- I (03 periods)
Classification of materials into conducting, semi conducting and insulating materials through a brief reference to their atomic structure and energy bands.

Unit:- II (12 periods)
Basics of Conducting Materials Resistance and factors affecting it such as alloying and temperature etc. Classification of conducting material as low resistivity and high resistivity materials, Low resistance materials Copper- 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 Aluminum - General properties as conductor: Resistivity, temperature coefficient, density, mechanical properties of hard and annealed aluminum, solderability, contact resistance. Applications of aluminum in the field of electrical engineering Steel - General properties as conductor: Resistivity, corrosion, temperature coefficient, density, mechanical properties, solderability, Applications in the field of electrical engineering Introduction to bundle conductors and its applications Low resistivity copper alloys: Brass, Bronze (cadmium and Beryllium), and their practical applications with reasons for the same Applications of special metals e.g. Silver, Gold, and Platinum etc. High resistivity materials and their applications e.g., manganin, constantin, nichrome, mercury, platinum, carbon and tungsten, Tantalum. Superconductors and their applications.

Unit:- III (05 periods)
Review of Semi-conducting Materials: Semi conducting material such as Germanium, Silicon, Carbon-their atomic structure/application/against, pure and impure semi conductors and their use for making electronic devices. Material used for special purpose semiconductor, diode, contacts, power transistor, substrate, integrated circuits and power handling devices.

Unit:- IV (12 periods)
Insulating materials; General Properties Electrical Properties Volume resistivity, surface resistance, dielectric loss, dielectric strength (breakdown voltage) dielectric constant. Physical Properties Hygroscopicity, tensile and compressive strength, abrasive resistance, brittleness. Thermal Properties Heat resistance, classification according to permissible temperature rise. Effect of overloading on the life of an electrical appliance, increase in rating with the use of insulating materials having higher thermal stability, Thermal conductivity, Electro-thermal breakdown in solid dielectrics. Chemical Properties Solubility, chemical resistance, weather ability. Mechanical properties, mechanical structure, tensile structure

Unit:- V**(13 periods)**

Insulating Materials and their applications. Plastics a. Definition and classification b. Thermosetting materials: Phenol-formaldehyde resins (i.e. Bakelite) amino resins (urea formaldehyde and melamine - formaldehyde), epoxy resins - their important properties and applications c. Procedure of preparation of plastic (PVC) d. Thermo-plastic materials: Polyvinyl chloride (PVC), polyethylene, silicons, their important properties and applications. Natural insulating materials, properties and their applications.

- a. Mica and Mica products
- b. Asbestos and asbestos products
- c. Ceramic materials (porcelain and steatite)
- d. Glass and glass products
- e. Cotton
- f. Silk
- g. Paper (dry and impregnated)
- h. Rubber, Bitumen
- i. Mineral and insulating oil for transformers switchgear capacitors, high voltage insulated cables, insulating varnishes for coating and impregnation
- j. Enamels for winding wires
- k. Glass fibre sleeves

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

Unit:- VI**(19 periods)**

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, method of reduction of eddy current loss and hysteresis loss

Soft Magnetic Materials

- a) Alloyed steels with silicon: High silicon, alloy steel for transformers, low silicon alloy steel for electric rotating machines
- b) Cold rolled grain oriented steels for transformer, Non-oriented steels for rotating machine
- c) Nickel-iron alloys
- d) Soft Ferrites

Hard magnetic materials - Tungsten steel, chrome steel, hard ferrites and cobalt steel, their applications Special Materials, Thermocouple, bimetal, leads soldering and fuses material, mention their applications. Introduction of various engineering materials necessary for fabrication of electrical machines such as motors, generators, transformers etc

LIST OF PRACTICALS

1. A market survey of different Electrical and Electronics materials available in market will be conducted by students. They will submit a report, which will include names, types, specifications, identification, testing of components, manufacturing details and related cost.
2. Case study/data manuals of different wires/cables/fuses/sockets etc. A report will be submitted by the students.

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 Electronic
2. Components and Materials by Grover and Jamwal, Dhanpat Rai and Co., New Delhi Electrical
3. Engineering Materials by Sahdev, Uneek 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
Electrical Engineering Materials by Rakesh Dogra, SK Kataria and Sons, NEW Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (Period)	Marks Allocation (%)
I	03	5
II	12	18
III	05	09
IV	12	18
V	13	20
VI	19	30
TOTAL	64	100

3.5 'C' for ELECTRONICS

L T P
Periods/week 3-1-5

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

Unit:- I (12 periods)

Algorithm and Program Development

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

Unit:- II (36 periods)

Program Structure (C Programming)

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

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

LIST OF PRACTICALS

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

RECOMMENDED BOOKS

1. Programming in C by Balagurusamy, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Programming in C by Gottfried, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Programming in C by Kerning Lan and Richie; Prentice Hall of India, 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, VikasPublishing 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 Education Pvt Ltd, New Delhi
11. Pointers in C by Yashwant Kanetkar, BPB Publishers New Delhi
12. Programming in Applications by Chandershekhar, Unique International Publications, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (Period)	Marks Allocation(%)
I	12	25
II	36	75
Total	48	100