

### 3.1 ELECTRICAL ENGINEERING AND MACHINES

L T P  
Periods/week 3 1 4

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

#### DETAILED CONTENTS

1. **Over view of DC Circuits** (08 period)
  - Basic concept of AC & DC
    - Applications of Kirchoff's Laws in solving electrical network problems.
    - Network theorem such as superposition, Thevenin theorem, Norton theorem and maximum power transfer theorem.
    - Star-delta transformation
  
2. **AC fundamentals** (10 period)
  - 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
  
3. **Three phase supply** (10period)
  - Advantage of three phase system over single phase system
  - Star –delta connection
  - 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
  
4. **Transformer** (10 period)

Working principle of a Transformer, constructional features, voltage and current transformation. Methods of connection 3 phase transformers, current and voltage relationship, auto transformer and its uses, instruments transformer, voltage regulation and its significance, need for isolation. Losses in a transformer, cooling of transformer
  
5. **Electrical Machines** (16 Period)

Principles of electromechanical energy conversion,  
DC Machines: Types, e.m.f. equation of generator and torque equation of motor, construction characteristics and applications of dc motors, speed control of DC motor.  
Single Phase Induction Motor: Principle of operation and construction brief of single phase motor introduction to methods of starting, applications.

Three Phase Induction Motor: Types, constructional brief & Principle of operation, Slip-torque characteristics, speed control and starting methods

Three Phase Synchronous Machines: Constructional brief & Principle of operation of alternator and synchronous motor and their applications.

## 6. Batteries

(10Period)

- Basic idea about primary and secondary cells,
- Construction, working and applications of Lead-Acid, Nickel-Cadmium and Silveroxide batteries,
- 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,
- Testing of lead acid battery for fully charged condition and their specification
- Application of lead acid battery
- Introduction to maintenance free batteries.

## LIST OF PRACTICALS

1. Familiarization of measuring instruments viz. voltmeter, ammeter, wattmeter and other accessories
2. To measure (very low) resistance of an ammeter and (very high) resistance of a voltmeter
3. To verify in d.c. circuits
  - Thevenin's theorem
  - Norton's theorem
  - Super Position Theorem
  - Maximum Power Transfer Theorem
4. To find a voltage current relationship in a single phase R-L and R-C Series circuits, draw their impedance triangles and determination of the power factor in each case.
5. To determine effect of a single phase transformer from the data obtained through open circuit and short circuit test.
6. To connect the primary and secondary winding of a three phase transformer and to verify line and phase current and voltage relationship respectively.
7. To connect a dc shunt motor with supply through a 3 point starter and to run the motor at different speeds with the help of a field regulator.
8. To run a 3 phase induction motor with the help of a star- delta starter. To change the direction of rotation of the motor.
9. To run a synchronous motor with a.c. supply and to measure speed to verify the relation  $N = 120f/p$ .
10. To test a lead – acid storage battery for charged & discharged condition (with hydrometer & to recharge it)

## INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

## 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 Nagrahand 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

Topic	Time Allotted (period)	Marks Allocation(%)
1	08	15
2	10	15
3	10	15
4	10	15
5	16	25
6	10	15
<b>Total</b>	<b>64</b>	<b>100</b>

## 3.2 ANALOG ELECTRONICS

L T P

Periods/week 3 1 4

### RATIONALE

This subject will enable the student to have conceptual understanding of conductors, semiconductors and insulators, extrinsic and intrinsic semi-conductors, p-n junction, need of rectifiers in electronics, understanding of filters in rectifiers, tunnel diodes, LEDs, varactor diodes, LCD, understanding the working of transistors in various configuration; understanding of FETs and MOSFET etc. For effective functioning in the field of electronics service industry. The teacher should give emphasis on understanding of concepts and explanation of various terms used in the subject. Practical exercises will reinforce various concepts. Industrial/field exposures must be given by organizing visit to local electronic industries.

### DETAILED CONTENTS

1. Semi conductor Physics (12 period)
  - Review of basic atomic structure and energy level, concept of insulator, conductors and semi conductors, atomic structure of Ge and Si, covalent bonds
  - Concept of intrinsic and extrinsic semiconductor, P and N impurities, doping of impurity
  - P and N type semiconductors and their conductivity. Effect of temperature on conductivity of intrinsic semi conductor
  - Energy level diagram of conductors, insulators and semi conductors, minority and majority carriers
  - Basic idea of Hall Effect and its uses
  
2. Semi Conductor Diode (12 period)
  - 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 and their calculation from diode characteristics
  - Diode as half wave, full wave and bridge rectifier. PIV, rectification efficiencies and ripple factor calculations, shunt capacitor filter, series inductor filter, LC filter and  $\pi$  filter
  - Type of diodes, characteristics and applications of Zener diode. Zener and avalanche breakdown, use of Zener diode as a voltage regulator
  
3. Introduction to Bipolar Transistor (12 period)

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; input and output dynamic resistance in CB and CE configurations; current

amplification factors. Comparison of CB, CE and CC Configurations, Power rating of Transistor

4. Transistor Biasing Circuits (6 period)

Concept of transistor biasing and selection of operating point. Need for stabilization of operating point. Different types of biasing circuits, Load line Analysis , Concept of AC load Line, Stability Factor

5. Single Stage Transistor Amplifier (10 period)

Classification of Amplifier

Single stage transistor amplifier circuits, a.c load line and its use in calculation of currents and voltage gain of a single stage amplifier circuit. Explanation of phase reversal of output voltage with respect to input voltage.H-parameters and their significance. Calculation of current gain, voltage gain, input impedance and output impedance using h- parameter

6. FET, MOSFET & UJT (12 period)

Construction, operation and characteristics of FET and its application

- Construction, operation and characteristics of MOSFET in depletion and enhancement modes and its applications
- C-MOS advantages and applications
- Comparison of JFET, MOSFET and BJT
- FET amplifier circuit and its working principle. (No analysis)
- Construction, operations and application of UJT.

## 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
  - $\pi$  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
10. To measure the Q-point and note the variation of Q- point
  - By increasing the base resistance in fixed biased circuit
  - By changing out of bias resistance in potential driver circuit
11. To measure voltage gain, input, output impedance in single stage CE amplifier circuits
12. To Plot the V-I Characteristics of UJT & use of UJT as relaxation oscillator.

## INSTRUCTIONAL STRATEGY

The aim of this subject is to provide the knowledge of the fundamental concepts related to basic electronics. The teacher should give more emphasis on understanding of concepts and the measuring of various terms used in the subject. Practical exercises should be included to reinforce the various concepts. Practical applications of semiconductor diodes, transistors, field effect transistors etc must be elucidated to the students.

## 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, Jyotesh Malhotra 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

Topic	Time Allotted (Period)	Marks Allocation
1.	12	15
2.	12	20
3.	12	20
4.	06	10
5.	10	15
6.	12	20
<b>Total</b>	<b>64</b>	<b>100</b>

### 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

1. Introduction (02 period)
  - Comparison between analog and digital signal
  - Applications and advantages of digital signals
  
2. Number System (04period)  
+ (01 T)
  - Binary, octal and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa
  - Binary addition, subtraction, multiplication and division including binary points. 1's and 2's complement method of addition/subtraction, sign magnitude method of representation, floating point representation
  
3. Codes and Parity (05period)  
+ (01 T)
  - Concept of code, weighted and non-weighted codes, examples of 8421, BCD, excess-3 and Gray code
  - Concept of parity, single and double parity and error detection code.
  
4. Logic Gates and Families (06period)  
+ (02 T)
  - a) Concept of negative and positive logic
  - b) Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, NAND and NOR as universal gates
  - c) Logic family classification
    - Definition of SSI, MSI, LSI, VLSI
    - 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 C MOS families, ECL & IIL
    - Open collector and totem pole output circuits
    - Introduction to tri- state devices, tri state buffer and Inverter circuits

5. Logic Simplification (04period)  
+ (02 T)
- Postulates of Boolean algebra, De Morgan's Theorems. Various identities. Formulation of truth table and Boolean equation for simple problem. Implementation of Boolean (logic) equation with gates
  - Karnaugh map (upto 4 variables) and simple applications in developing combinational logic circuits
  - Concept of POS & SOP.
6. Arithmetic circuits (04period)  
+ (01 T)
- Half adder and Full adder circuit, design and implementation.
  - Half and Full subtracter circuit, design and implementation.
  - 4bit binary Adder and Subtractor IC (7483)
7. Decoders, Multiplexer and De Multiplexer (07period)  
+ (01 T)
- Four bit decoder circuits for 7 segment display and decoder/driver ICs.
  - Multiplexers and De-Multiplexers
  - Basic functions and block diagram of MUX and DEMUX. Different ICs
8. Latches and flip flops (06period)  
+ (01 T)
- Concept and types of latch with their working and applications
  - Operation using waveforms and truth tables of RS, T, D, Master/Slave JK flip flops.
  - Difference between a latch and a flip flop
  - Flip flop ICs
9. Counters (06period)  
+ (02 T)
- Introduction to Asynchronous and Synchronous counters
  - Binary counters
  - Divide by N ripple counters, Decade counter.
  - Up/down counter
  - Ring counter with timing diagram
  - Counter ICs
10. Shift Register (05period)  
+ (01 T)
- Introduction and basic concepts including shift left and shift right.
  - Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out.
  - Universal shift register
  - Buffer register, Tristate Buffer register
  - IC 7495

11. A/D and D/A Converters (06period)  
+ (02 T)
- a) Working principle of A/D and D/A converters
  - b) Brief idea about different techniques A/D conversion and study of
    - Stair step Ramp A/D converter
    - Dual Slope A/D converter
    - Successive Approximation A/D Converter
  - c) Detail study of
    - Binary Weighted D/A converter
    - R/2R ladder D/A converter
  - d) Applications of A/D and D/A converter
  - e) Sample and Hold Circuit

12. Memories (05period)  
+ (01 T)

Memory organization, Classification of semi conductor memories. ROM, PROM, DROM, EPROM, EEPROM, RAM, CCD memories, Programmable logic devices, programmable logic array, programmable array logic

- 13 Arithmetic & Logic Unit (05 Periods)  
+ (01 T)

Basic idea about arithmetic logic unit w.r.t IC 74181 and applications, implementation of binary multiplication, division, subtraction and addition.

### LIST OF PRACTICALS

- 1) Verification and interpretation of truth tables for AND, OR, NOT NAND, NOR and Exclusive OR (EXOR) and Exclusive NOR(EXNOR) gates
- 2) Realisation of logic functions with the help of NAND or NOR gates
- 3) To design a half adder & full adder using XOR and NAND gates and verification of its operation
- 4) Realisation of 4 bit adder/subtractor using IC
- 5) Verification of truth table for positive edge triggered, negative edge triggered, level triggered IC flip-flops (At least one IC each of D latch , D flip-flop, JK flip-flops)
- 6) Verification of truth table for encoder and decoder ICs, Mux and DeMux
- 7) To design a 4 bit SISO, SIPO, PISO, PIPO shift registers using JK/D flip flops and verification of their operation
- 8) Asynchronous Counter ICs  
Verification of truth table for any one universal shift register IC  
Use of IC 7490 or equivalent TTL (a) divide by 2 (b) divide by 10 Counter  
OR  
Use of IC 7493 or equivalent TTL (a) divide by 2 (b) divide by 8 (c) divide by 16 counter
9. To design A/D and D/A convertor and verify their operations.

10. Familiarity use of EPROM programmes
11. Verify the writing and reading operation of RAM IC
12. Verify the logic operation, arithmetic operation of ALU IC

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

## **INSTRUCTIONAL STRATEGY**

The digital systems in microprocessors have significant importance in the area of electronics. Adequate competency needs to be developed by giving sufficient practical knowledge in microprocessors (programming as well as interfacing), A/D, D/A Converters and other topics. Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. Programming exercises other than the tested in circulation may be given to the students.

## **RECOMMENDED BOOKS**

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

<b>Topic</b>	<b>Time Allotted (period)+ Tutorial</b>	<b>Marks Allocation</b>
1	02	05
2	05	10
3	05	05
4	08	10
5	06	10
6	05	05
7	08	10
8	07	10
9	08	10
10	06	05
11	08	10
12	06	05
13	06	05
<b>Total</b>	<b>80</b>	<b>100</b>

**RATIONALE**

The study of principles of communication systems leads to further specialized study of audio and video systems, line communications and microwave communication systems. Thus the diploma-holder in Electronics and Communication Engineering shall find employment in areas of R and D, production, servicing and maintenance of various communication systems. The students should understand the advantage and limitations of various analog and digital modulation systems, transmitters, receivers and antennas relate to them while studying practical communication systems.

**DETAILED CONTENTS**

1. Introduction (04 period)
  - Need for modulation, frequency translation and demodulation in communication systems
  - Basic scheme of a modern communication system
2. Amplitude modulation (05period)  
+ (02 T)
  - Derivation of expression for an amplitude modulated wave. Carrier and side band components. Modulation index. Spectrum and BW of AM Wave. Relative power distribution in carrier and side bands
  - Elementary idea of DSB-SC, SSB-SC, ISB and VSB modulations, their comparison, and areas of applications
3. Frequency & Phase Modulation (07period)  
+ (02 T)
  - Expression for frequency modulated wave and its frequency spectrum (without Proof and analysis of Bessel function), Modulation index, maximum frequency deviation and deviation ratio, BW of signals
  - Effect of noise on FM carrier. Noise triangle, Role of limiter, Need for pre-emphasis and de-emphasis
  - Expression for phase modulated wave, modulation index
  - Comparison of Phase, FM and AM in communication systems
4. Modulators (07period)  
+ (02 T)
  - a. AM Modulators  
Circuit Diagram and working operation of
    - i. Collector and Base Modulator
    - ii. Square Law Modulator
      - Switching Modulator
      - Balanced Modulator
      - Ring Modulator
  - b. FM Modulators

Circuit Diagram and working of reactance modulator, varactor diode modulator, VCO and Armstrong phase modulator. Stabilization of carrier for using AFC (Block diagram approach)

- 5- Demodulators (07period)  
+ (02 T)
- a. AM Demodulators
- Principles of demodulation of AM wave using diode detector circuit; concept of Clipping and formula for RC time constant for minimum distortion (no derivation)
  - Principle of demodulation of AM Wave using synchronous detection.
- b. FM Demodulators
- Basic principles of FM detection using slope detector
  - Principle of working of the following FM demodulators
    - Foster-Seeley discriminator
    - Ratio detector
    - Quadrature detector
    - Phase locked Loop (PLL) FM demodulators
- 6- Pulse Modulation (08 period)  
+ (02 T)
- Statement of sampling theorem and elementary idea of sampling frequency for pulse modulation
  - Basic concepts of time division multiplexing (TDM) and frequency division multiplexing (FDM)
  - Types of pulse modulation-PAM, PPM, PWM (Generation &Detection) and their comparison
  - Pulse code Modulation (PCM) Basic scheme of PCM system. Quantization, quantization error, companding Advantages of PCM systems.
7. AM/FM Transmitters (04 period)  
+ (02 T)
- Classification of transmitters
  - Block diagram and working principles of AM transmitters Reactance transmitter & Armstrong FM Transmitters.
8. AM/FM Radio Receivers (12 Period)  
+ (02 T)
- Block Diagram and working principle of super heterodyne AM receiver, function of each block and typical wave at I/P and O/P of each block, Advantages of super heterodyne reception.
  - Performance characteristics of a radio receiver-sensitivity, selectivity, fidelity, S/N ratio, image rejection ratio and their measurement procedure.
  - Selection criteria of intermediate frequency (IF), Concepts of Simple and delayed AGC.
  - Block diagram of an FM receiver, function of each block and wave forms at input and output different blocks.
  - Block diagram of communication receivers, differences with respect to broadcast receivers.

## 9. Antennas

(10 Period)  
+ (02 T)

Physical concept of radiation of electromagnetic energy from a dipole, type of propagation  
Brief idea of EM wave propagation & type of propagation, Concept of polarization of EM waves, electromagnetic spectrum and its various ranges. Tropospheric scattering in brief.

- a) Definition and physical concepts of the terms with antennas like point source, gain, directivity, aperture, effective area, radiation pattern, beam angle, beam width & radiation resistance.
- b) Types of antennas : brief description, characteristics and typical applications of
  - Half wave dipole.
  - Medium wave (mast) antenna
  - Yagi & ferrite rod antenna
- c) Brief description of broadside and end fire arrays, their radiation pattern and applications (without analysis); basic concept Tropospheric scattering brief idea about rhombic antenna and disc antenna.

### LIST OF PRACTICALS

1. To observe an AM wave on CRO produced by a standard signal generator using internal and external modulation & to measure the modulation index of the wave obtained
2. To obtain an AM wave from a square law modulator circuit and observe waveforms and to measure the modulation index of the obtained wave form
3. To obtain an FM wave and measure the frequency deviation for different modulating signal
4. To obtain modulating signal from an AM detector circuit and observe the pattern for different RC time constants and obtain its optimum value for least distortion
5. To obtain modulating signal from a FM detector
6. To observe PAM, PPM and PWM signal and compare it with the analog input signal
7. To feed an analog signal to a PCM modulator and compare the demodulated signal with the analog input. Also note the effect of low pass filter at the demodulated output
8. To plot the sensitivity & selectivity characteristics of a radio receiver and determine the frequency of maximum sensitivity.
9. To align AM broadcast radio receiver and study different faults and radio receiver & major the Voltage at the different points of a radio receiver
10. Installation of directional antenna for best reception.
11. Installation of dish antenna for best reception.

### INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

### RECOMMENDED BOOKS

1. Electronics Communication System by Kennedy, Tata McGraw Hill Education Pvt Ltd, New Delhi

2. Fundamentals of Communication System by Fitz, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Principles of Communication Engineering by Taub, Tata McGraw Hill Education Pvt Ltd,
4. Electronics Communication by KS Jamwal, DhanpatRai and Co, New Delhi
5. Radio Engineering by GK Mittal, Khanna Publishers, New Delhi
6. Principles of Communication Engineering by DR Arora, Ishan Publications, Ambala
7. Communication Engineering by A Kumar
8. Principles of Communication Engineering by Manoj Kumar, SatyaPrakashan, New Delhi
9. Principles of Communication Engineering by Anokh Singh, S.Chand and Co., New Delhi
10. Principles of Communication Engineering by Roody , Coolin

### SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (period)	Marks Allocation
1	04	07
2	07	10
3	09	10
4	09	10
5	09	10
6	10	15
7	06	08
8	14	15
9	12	15
<b>Total</b>	<b>80</b>	<b>100</b>

### 3.5 ELECTRONIC WORKSHOP CUM MINOR PROJECT

L TP

Periods/week- - 4

#### RATIONALE

In electronics, with theoretical knowledge the practice is also very important. Starting from identification of components to testing of different circuit the practice must be there. To identify components, To use data book, To identify leads, Use of test equipment such as multi-meter to oscilloscope, To learn the technique of soldering and de-soldering are the areas where practice is required and it makes perfect electronics engineer. Minor project work aims at exposing the students to various developments taking place in the field of electronics and related areas in addition to developing interest in the students about working and fabrication of electronics devices. The project may be selected from utility items pertain to their laboratories or homes. It would enable first hand experience of components, their purchase, assembly, testing and trouble shooting. It would also boost up confidence of the students in repairing and maintenance of electronics gadgets. There should not be more than 2-3 students for each project. A report must be prepared with a hard and soft copy. The purpose of this subject is also to give practice to the students in elementary design and fabrication of simple electronic circuits. The topics of assembly, soldering, testing, and documentation have been included to give overall picture of the process of manufacturing of electronic devices. The teacher may guide/ help students to identify their minor project work and chalk out their plan of action well in advance preferably at the beginning of 3rd semester For this purpose, the concerned teachers must identify curriculum related industrial problems which should be expository in nature and ask students (individual/group) to carry out their investigation/activity such that enough industrial exposure is gained by them during this process.

#### DETAILED CONTENTS

1. Laboratory Experiences (06 period)
  - Identification of components
  - Practice for color coding of resistance
  - Practice for identification of various components such as diode, capacitors, transistors, SCR, Triac and different ICs
  - Understand the use of data book for transistors, Diodes, SCR and triac
  - Understand the use of data book for TTL and CMOS ICs
  - Testing of different components using multi-meter
2. Use of electronic instruments (08 period)
  - Practice for the use of multi-meter
  - Practice for the use of signal generator
  - Practice for the use of power supply
  - Practice for the use of oscilloscope
3. Designing the PCB layout using computer software (12 period)
  - Understanding the use of printed circuit board in electronics.
  - Designing practice of PCB layout for a simple electronics circuit such as rectifier, transistor, amplifier etc.
  - Use of software --Work bench and PSPICE

4. Soldering the PCB (05 period)
  - Soldering practice for PCB
  - Soldering the PCB design in layout topic.
  - Desoldering practice
  
5. Testing of PCB (05period)
  - After soldering the component on given PCB testing the continuity and input / output result of given circuit
  
6. Fault finding of electronic circuit (06 period)
  - Basic idea of fault finding procedure
  
7. Minor Project Work (24 Period)
 

**Minimum 04 Project to be fabricated by each student**  
 Students can also select any other project with the advice of teacher

  1. Regulated power supply
  2. Timers using 555 and other oscillators
  3. Touch plate switches – transistorized or 555 based
  4. Door bell/cordless bell
  5. Clapping switch and IR switch
  6. Blinkers
  7. sirens and hooters
  8. FM Transmitter and Receiver
  9. Electronic toy gun, walker, blinkers
  10. Electronic dice
  11. Cell charger, battery charger, mobile charger
  12. Fire/smoke/intruder alarm
  13. Liquid level controller
  14. Counters
  15. Combination locks
  16. Electronics musical instruments
  17. Telephone handset
  18. Audio amplifiers
  19. Tape recorders
  20. Automatic stabilizer/CVT
  21. Emergency light
  22. Design and manufacture of transformer
  23. Fan regulator
  24. Triac using Fan Regulator
  25. 555 using lighting delay Circuits
  26. Temperature sensor based fabrication
  27. Design and fabricate transistor switch to operate an LED.
  28. Design and Fabricate a single stage Amplifier for 1 KHz

## RECOMMENDED BOOKS

1. Data books for transistors Diodes & SCR
2. Data book for TTL and CMOS ICs
3. PCB designing Books

## SUGGESTED DISTRIBUTION OF MARKS

<b>Topic</b>	<b>Time Allotted (period Practical )</b>
1	06
2	08
3	12
4	04
5	04
6	06
7	24
<b>Total</b>	<b>64</b>

### 3.6 COMPUTER PROGRAMMING USING C

L T P  
Periods/week 2 - 4

#### 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 (04 period)
  - 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) (20 period)
  - 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
  
3. Software Applications in Electronics Engineering (08 period)

Computer application overview through various applications software related to Electronics Engineering branch viz: ORCAD & MATLAB

## LIST OF PRACTICALS

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

## INSTRUCTIONAL STRATEGY

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

## 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- YashwantKanetkar, 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. Web site [www.Beyondlogic.org](http://www.Beyondlogic.org)
12. Pointers in C by YashwantKanetkar, BPB Publishers New Delhi
13. Programming in Applications by Chandershekar, Unique International Publications, Jalandhar
14. The essentials of Computer Organizing and Architecture by Linda Null and Julia Labur, Narosa Publishing House Pvt. Ltd., New Delhi

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic</b>	<b>Time Allotted (period)</b>	<b>Marks Allocation (%)</b>
1	04	15
2	20	70
3	08	15
<b>Total</b>	<b>32</b>	<b>100</b>