3.1 ELECTRONIC INSTRUMENTS AND MEASUREMENT

L	T	P
4	-	2

RATIONALE

In the real world of work the technician is required to handle wide variety of instruments while testing, trouble shooting, calibration etc. the study of this subject will help students to gain the knowledge of working principles and operation of different instruments. During practical sessions, he will acquire the requisite skills.

DETAILED CONTENTS

1. Basics of Measurements (06 hrs)

   Measurement, method of measurement, types of instruments

   Specifications of instruments: Accuracy, precision, sensitivity, resolution, range, errors in measurement, sources of errors, limiting errors, loading effect, importance and applications of standards and calibration

2. Voltage, Current and Resistance Measurement (12 hrs)

   - Principles of operation and construction of permanent magnet moving coil (PMMC) instruments.
   - Moving iron type instruments, measurement of d.c voltage and current, measurement of d.c voltage and current, milli-volt measurement.
   - Measurement of voltage, current and resistance using multimeter.
   - Specifications of multimeter and its applications.
   - Limitations with regard to frequency and input impedance.

3. Cathode Ray Oscilloscope (10 hrs)

   - Construction and working of Cathode Ray Tube(CRT)
   - Time base operation and need for blanking during flyback, synchronization
   - Block diagram, description of a basic CRO and triggered sweep oscilloscope, front panel controls.
   - Specifications of CRO and their explanation.
   - Measurement of voltage, current, frequency, time period and phase using CRO.
   - CRO probes, special features of dual beam, dual trace, delay sweep.
   - Digital storage oscilloscope (DSO) : block diagram and working principle.

4. Signal Generators and Analytical Instruments (08 hrs)

- Explanation of block diagram specifications of low frequency and RF generators, pulse generator, function generator
- Wave analyzer, distortion measurement and spectrum analyser

5. Impedance Bridges and Q Meters (14 hrs)

- Wheat stone bridge
- AC bridges: Maxwell's induction bridge, Hay's bridge, De-Sauty's bridge, Schering bridge and Anderson bridge
- Block diagram description of laboratory type RLC bridge, specifications of RLC bridge
- Block diagram and working principle of Q meter

6. Digital Instruments (14 hrs)

- Comparison of analog and digital instruments
- Working principle of ramp, dual slope and integration type digital voltmeter
- Block diagram and working of a digital multimeter
- Measurement of time interval, time period and frequency using universal counter/frequency counter
- Working principle of logic probe, logic pulser, logic analyzer, logic comparator, signature analyzer

LIST OF PRACTICALS

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance
2. To observe the limitations of a multimeter for measuring high frequency voltage
3. Measurement of voltage, frequency, time period and phase using CRO
4. Measurement of rise time and fall time using CRO
5. Measurement of Q of a coil and its dependence on frequency
6. Measurement of voltage, frequency, time and phase using DSO
7. Measurement of resistance and inductance of coil using RLC Bridge
8. Use of logic pulser and logic probe
9. Measurement of time period, frequency, average period using universal counter/ frequency counter

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 Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Sons, New Delhi
2. Electronics Measurement and Instrumentation by Oliver, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Electronics Instrumentation by Cooper, Prentice Hall of India, New Delhi
4. Electronics Test and Instrumentation by Rajiv Sapra, Ishan Publications, Ambala
5. Electronics Instrumentation by JB Gupta, Satya Prakashan, New Delhi

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No.	Topic	Time Allotted (hrs)	Marks Allocation%
1.	Basics of Measurements	6	5
2.	Voltage, Current and Resistance Measurement	12	20
3.	Cathode Ray Oscilloscope	10	15
4.	Signal Generators and Analysis Instruments	8	10
5.	Impedance Bridges and Q Meters	14	25
6.	Digital Instruments	14	25
Total		**64**	**100**

3.2 PRINCIPLES OF COMMUNICATION ENGINEERING

L T P
4 - 2

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 on a comparative a scale and relate to them while studying practical communication systems.

DETAILED CONTENTS

1. Introduction (04 hrs)

   a) Need for modulation, frequency translation and demodulation in communication systems
   b) Basic scheme of a modern communication system.

2. Amplitude modulation (06 hrs)

   a) 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.

   b) Elementary idea of DSB-SC, SSB-SC, ISB and VSB modulations, their comparison, and areas of applications

3. Frequency Modulation (06 hrs)

   a) Expression for frequency modulated wave and its frequency spectrum (without Proof and analysis of Bassel function) Modulation index, maximum frequency deviation and deviation ratio, BW of signals, Carson's rule.
   b) Effect of noise on FM carrier. Noise triangle, Role of limiter, Need for pre-emphasis and de-emphasis, capture effect.
   c) Comparison of FM and AM in communication systems

4. Phase Modulation (06 hrs)

   Expression for phase modulated wave, modulation index, comparison with frequency modulation.

5. Principles of AM Modulators (10 hrs)

   Circuit Diagram and working operation of:

   a) Collector and Base Modulator

b) Square Law Modulator

- Switching Modulator
- Balanced Modulator
- Ring Modulator

6. Principles of FM Modulators (06 hrs)

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

7. Demodulation of AM Waves (06 hrs)

a) Principles of demodulation of AM wave using diode detector circuit; concept of Clipping and formula for RC time constant for minimum distortion (no derivation)

b) Principle of demodulation of AM Wave using synchronous detection.

8. Demodulation of FM Waves (06 hrs)

a) Basic principles of FM detection using slope detector

b) Principle of working of the following FM demodulators

- Foster-Seeley discriminator
- Ratio detector
- Quadrature detector
- Phase locked Loop (PLL) FM demodulators

9. Pulse Modulation (14 hrs)

a) Statement of sampling theorem and elementary idea of sampling frequency for pulse modulation

b) Basic concepts of time division multiplexing (TDM) and frequency division multiplexing (FDM)

c) Types of pulse modulation-PAM, PPM, PWM (Generation &Detection) and their comparison

d) Pulse code Modulation (PCM) Basic scheme of PCM system. Quantization, quantization error, companding, block diagram of TDM-PCM communication system and function of each block. Advantages of PCM systems. Concepts of differential PCM (DPCM)

e) Delta Modulation (DM)
Basic principle of delta modulation system, advantages of delta modulation system over PCM system. Limitations of delta modulation, concept of adaptive delta modulation (ADM)

LIST OF PRACTICALS

1. a) To observe an AM wave on CRO produced by a standard signal generator using internal and external modulation
   b) To measure the modulation index of the wave obtained in above practical

2. a) To obtain an AM wave from a square law modulator circuit and observe waveforms
   b) To measure the modulation index of the obtained wave form.

3. To obtain an FM wave and measure the frequency deviation for different modulating signals.

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 the sampled signal and compare it with the analog input signal. Note the effect of varying the sampling pulse width and frequency on the sampled output.

7. To observe and note the pulse amplitude modulated signal (PAM) and compare them with the corresponding analog input signal

8. To observe PPM and PWM signal and compare it with the analog input signal

9. 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.

10. To study the process of delta modulation/demodulation

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

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

(1) Fundamentals of Communication System by Fitz, Tata McGraw Hill Education Pvt Ltd, New Delhi

(2) Principles of Communication Engineering by Taub, Tata McGraw Hill Education Pvt Ltd,

(3) Electronics Communication by KS Jamwal, Dhanpat Rai and Co, New Delhi

(4) Radio Engineering by GK Mittal, Khanna Publishers, New Delhi

(5) Principles of Communication Engineering by DR Arora, Ishan Publications, Ambala

(6) Communication Engineering by A Kumar

(7) Principles of Communication Engineering by Manoj Kumar, Satya Prakashan, New Delhi

(8) Principles of Communication Engineering by Anokh Singh, S.Chand and Co., New Delhi

(9) Principles of Communication Engineering by Roody , Coolin

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No.	Topic	Time Allotted (hrs)	Marks Allocation
1.	Introduction	4	5
2.	Amplitude Modulation	6	10
3.	Frequency Modulation	6	10
4.	Phase Modulation	6	10
5.	Principles of AM Modulators	10	15
6.	Principles of FM Modulators	6	10
7.	Demodulation of AM Waves	6	10
8.	Demodulation of FM Waves	6	10
9	Pulse Modulation	14	20
Total		**64**	**100**

3.3 DIGITAL ELECTRONICS

L T P
4 - 3

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 hrs)

   a) Comparison between analog and digital signal.
   b) Applications and advantages of digital signals.

2. Number System (07 hrs)

   a) Binary, octal and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa.
   b) 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 (04 hrs)

   a) Concept of code, weighted and non-weighted codes, examples of 8421, BCD, excess-3 and Gray code.

   b) Concept of parity, single and double parity and error detection

   c) Alpha numeric codes: ASCII and EBCDIC.

4. Logic Gates and Families (07 hrs)

   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 comparison between TTL + C MDS
   - Characteristics of TTL and C MOS digital gates. Delay, speed, noise margin, logic levels, power dissipation, fan-in, power supply requirement and comparison between TTL and C MOS families

5. Logic Simplification (06 hrs)

a) 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

b) Karnaugh map (upto 4 variables) and simple application in developing combinational logic circuits

6. Arithmetic circuits (06 hrs)

a) Half adder and Full adder circuit, design and implementation.
b) Half and Full subtracter circuit, design and implementation.
c) 4 bit adder/subtracter.
d) Adder and Subtractor IC (7484)

7. Decoders, Multiplexeres and De Multiplexeres (06 hrs)

a) Four bit decoder circuits for 7 segment display and decoder/driver ICs.
b) Multiplexers and De-Multiplexers
c) Basic functions and block diagram of MUX and DEMUX. Different types and ICs

8. Latches and flip flops (06 hrs)

a) Concept and types of latch with their working and applications
b) Operation using waveforms and truth tables of RS, T, D, Master/Slave JK flip flops.
c) Difference between a latch and a flip flop
d) Flip flop ICs

9. Counters (8 hrs)

a) Introduction to Asynchronous and Synchronous counters
b) Binary counters
c) Divide by N ripple counters, Decade counter.
d) Pre settable and programmable counters
e) Up/down counter
f) Ring counter with timing diagram
g) Counter ICs

10. Shift Register (07 hrs)

Introduction and basic concepts including shift left and shift right.

a) Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out.
b) Universal shift register
c) Buffer register, Tristate Buffer register
d) IC 7495

11. A/D and D/A Converters (08 hrs)

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) Performance characteristics of A/D and D/A converter.
e) Applications of A/D and D/A converter.

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 using XOR and NAND gates and verification of its operation
Construction of a full adder circuit using XOR and NAND gates and verify its operation

4. 4 bit adder, 2's complement subtractor circuit using an 4 bit adder IC and an XOR IC and verify the operation of the circuit.

5. To design a NOR Gate Latch and verification of its operation

6 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).

7. Verification of truth table for encoder and decoder ICs, Mux and DeMux

8. To design a 4 bit SISO, SIPO, PISO, PIPO shift registers using JK/D flip flops and verification of their operation.

9. To design a 4 bit ring counter and verify its operation.

10. 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

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, Dhanpat Rai and Co., New Delhi
9. Digital Electronics by Rajiv Sapra, Ishan Publication, Ambala
10. Digital Electronics by BR Gupta, Dhanpat Rai & 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 FOR FACILITATING THE PAPER SETTER

Sr. No.	Topic	Time Allotted (hrs)	Marks Allocation
1.	Introduction	2	5
2.	Number System	7	15
3.	Codes and Parity	4	5
4.	Logic Gates and Families	4	5
5.	Logic Simplification	6	10
6.	Arithmetic Circuits	6	10
7.	Decoders, Multiplexers and Demultiplexers	6	10
8.	Latches and Flip flops	6	10
9	Counters	8	10
10.	Shift Registers	7	10
11.	A/D and D/A Converter	8	10
Total		**64**	**100**

3.4 ELECTRONIC DEVICES AND CIRCUITS

L T P
4 - 3

RATIONALE

Having attained basic knowledge of electronic devices like diodes, transistors, and elementary circuits, in second semester, this course will enable the students to learn about the use of transistors in analog circuits like power amplifier, multistage amplifier, oscillators, wave shaping circuits and in multivibrators etc. It also gives information about timer, operational amplifier, voltage regulator, ICs and their applications for effective functioning in the field of electronic service industry.

DETAILED CONTENTS

1. Multistage Amplifiers (10 hrs)

a) Need for multistage amplifier

b) Gain of multistage amplifier

c) Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth

2. Large Signal Amplifier (08 hrs)

a) Difference between voltage and power amplifiers

b) Importance of impedance matching in amplifiers

c) Class A, Class B, Class AB, and Class C amplifiers, collector efficiency and Distortion in class A,B,C

d) Single ended power amplifiers, Graphical method of calculation (without derivation) of out put power; heat dissipation curve and importance of heat sinks. Push-pull amplifier, and complementary symmetry push-pull amplifier

3. Feedback in Amplifiers (10 hrs)

a) Basic principles and types of feedback

b) Derivation of expression for gain of an amplifier employing feedback

c) Effect of feedback (negative) on gain, stability, distortion and bandwidth of an amplifier

d) RC coupled amplifier with emitter bypass capacitor

e) Emitter follower amplifier and its application

4. Sinusoidal Oscillators (08 hrs)

a) Use of positive feedback

b) Barkhausen criterion for oscillations

c) Different oscillator circuits-tuned collector, Hartley, Colpitts, phase shift, Wien's bridge, and crystal oscillator. Their working principles (no mathematical derivation but only simple numerical problems)

5. Tuned Voltage Amplifiers (06 hrs)

a) Series and parallel resonant circuits and bandwidth of resonant circuits

b) Single and double tuned voltage amplifiers and their frequency response characteristics

6. Wave Shaping Circuits (06 hrs)

a) General idea about different wave shapers

b) RC and RL integrating and differentiating circuits with their applications

c) Diode clipping and clamping circuits and simple numerical problems on these circuits

7. Multivibrator Circuits (08 hrs)

a) Working principle of transistor as switch

b) Concept of multi-vibrator: astable, monostable, and bistable and their applications

c) Block diagram of IC555 and its working and applications

d) IC555 as monostable and astable multi-vibrator

8. Operational Amplifiers (08 hrs)

a) Characteristics of an ideal operational amplifier and its block diagram

b) Definition of differential voltage gain, CMRR, PSRR, slew rate and input offset current

c) Operational amplifier as an inverter, scale changer, adder, subtractor, differentiator, and integrator

d) Concept of Schmitt trigger circuit and sample/hold circuit using operational amplifier and their application

LIST OF PRACTICALS

(1) Plot the frequency response of two stage RC coupled amplifier and calculate the bandwidth and compare it with single stage amplifier

(2) To measure the gain of push-pull amplifier at 1KHz

(3) To measure the voltage gain of emitter follower circuit and plot its frequency response

(4) Plot the frequency response curve of Hartley and Colpitts Oscillator

(5) Plot the frequency response curve of phase shift and Wein bridge Oscillator

(6) To observe the output waveforms of series and shunt clipping circuits

(7) To observe the output for clamping circuits

(8) Use of IC 555 as monostable multivibrator and observe the output for different values of RC

(9) Use of IC 555 as astable multivibrator and observe the output at different duty cycles

(10) To use IC 741 (op-amplifier) as

i) Inverter, ii) Adder, iii) Subtracter iv) Integrator

(11) To realize positive and negative fixed voltage AC power supply using three terminal voltage regulator IC (7805, 7812, 7905)

INSTRUCTIONAL STRATEGY

This subject being of fundamental importance for diploma holders in electronics engineering and related fields, emphasis on conceptual understanding may be given by taking the help of charts, simulation packages etc. Sufficient exercises may given to the students in single stage and multi-stage amplifier circuits in addition to simple exercises in fabricating and testing of various simple d.c circuits. The students may be encouraged to perform some additional practical exercises apart from the list provided.

LIST OF RECOMMENDED BOOKS

(1) Basic Electronics and Linear Circuits by NN Bhargava, Tata McGraw Hills, New Delhi
(2) Electronic Principles by Sahdev, Dhanpat Rai and Sons, New Delhi.
(3) Electronics Principles by Malvino, Tata McGraw Hills, New Delhi
(4) Electronic Devices and Circuits by Millman and Halkias, McGraw Hills, New Delhi
(5) Electronics Devices and Circuits by Bhupinderjit Kaur,modern Publishers, Jalandhar
(6) Basic Electronics by Grob, Tata McGraw Hills, New Delhi
(7) Art of Electronics by Horowitz
(8) Electronic Circuit Theory by Boylstead
(9) Electronic Devices and Circuits by BL Theraja, S Chand and Co Ltd. New Delhi
(10) Operational Amplifiers and Linear Integrated Circuits by Ramakant A. Gaykwad
(11) Electronics Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
(12) Electronics Devices and Circuits-II by Rajesh Kumar, Eagle Prakashan, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No.	***Topic***	**Time Allotted (hrs)**	**Marks Allocation**
1.	Multistage Amplifiers	10	20
2.	Large Signal Amplifier	08	15
3.	Feedback in Amplifier	10	15
4.	Sinusoidal Oscillators	08	15
5.	Tuned Voltage Amplifiers	06	10
6.	Wave Shaping Circuits	06	5
7.	Multivibrator Circuits	08	10
8.	Operational amplifiers	08	10
Total		**64**	**100**

3.5 ELECTRONICS DESIGN AND FABRICATION TECHNIQUES

L	T	P
-	-	6

RATIONALE

The purpose of this subject is to give practice to the students in elementary design and fabrication of the PCB. The topics of assembly, soldering, testing, and documentation have been included to give overall picture of the process of manufacturing of electronic devices. This subject has been merged with minor project work which aims at developing interest of the students about the, what is inside the electronics devices, what is happening and how it happens. The project may be small in size but should include only those components which he has studied in earlier classes, with a clear idea of signals processing. It would enable first hand experience of components, their purchase, assembly, testing and trouble shooting. It would boost up confidence of the students to repair and preparation 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 following contents will be discussed in lab classes.

DETAILED CONTENTS

1. Electronic Design (22 hrs)

   1.1 Selection and use of commonly used active and passive components

   1.2 Testing of active and passive components

   1.3 Develop skills in assembly of components, soldering, and soldering techniques

   1.4 Procedure for Cabinet Making

2. Fabrication Techniques (23 hrs)

   2.1 Printed Circuit Boards (PCBs):

   a) PCB board materials, their characteristics and plating, corrosion and its prevention.

   b) Photo processing, screen printing, etching, high speed drilling, buffing, surface treatment and protection from harsh environments, plated through holes, double sided and multilayer PCBs.

   c) Standards of board sizes. Modular assemblies edge connectors, multi board racks, flexible boards.

   d) Assembly of circuits on PCB, soldering techniques, role of tinning, flow and wave soldering, solderability, composition of solder. Edge connector. Elements of wire shaping.

2.2 Production

Storage and supply of components for assembly, role of incoming inspection of components, assembly line reduction, tools and jigs for lead bending. Manual and automatic insertion techniques. Closed loop assembly of modules and/or complete instruments. Specific examples of small scale and large-scale production be given to illustrate above mentioned methods.

2.3 Testing

Jigs and fixtures for operational testing of modules / sub- assemblies. Sequence testing for failure analysis. Environmental testing at elevated temperature and humidity. Vibration and mechanical endurance testing. Packing for transportation.

2.4 Documentation

Statement of brief specifications, detailed specifications and limitations. Block diagram detailed diagrams. Testing and checking points. Warning relative to high voltage for handling during repair. Fault location guide. Simple solutions for fault removal

2.5 Introduction to log books and history sheets

3. Every student must design and prepare a PCB, mount the components and assemble in a cabinet (32 hrs)

4. Computer Aided Design (CAD) (6 hrs)

Computer aided design of electric circuit using different software like Eagle, ORCAD, and Circuit Maker.

5. Production Planning (3 hrs)

6. CNC drilling, photo plating, concept of SMDs (Surface Mount Devices) (10 hrs)

Some of the projects are listed below which is just a guideline for selecting the minor project. Students can also select any other project with the advice of his teacher.

LIST OF PROJECTS:

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. Single hand AM or FM
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. Electronic Ballasts
19. Audio amplifiers
20. Tape recorders
21. Automatic stabilizer/CVT
22. Emergency light
23. Design and manufacture of transformer
24. Fan regulator
25. Dish Antenna

INSTRUCTIONAL STRATEGY

More emphasis may be laid on practical Project. Small industrial problems may be taken as assignments. Practical training regarding fabrication techniques using CAD may be carried out.

LIST OF RECOMMENDED BOOKS

1. Printed Circuit Board by Bosshart

2. Printed Circuit Board by RS Khandpur, Tata McGraw Hill Education Pvt Ltd., New Delhi

3. Electronics Techniques by Rajesh Kumar, NITTTR, Chandigarh

4. Modular CAD for PCBs using EAGLE Software by Rajesh Kumar, NITTTR, Chandigarh

5. Electronic Manufacturing Technology by KS Jamwal, Dhanpat Rai and Sons, New Delhi

3.6 COMPUTER PROGRAMMING AND APPLICATIONS

L	T	P
2	-	3

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)

   a) Steps in development of a program

   b) Flow-charts, algorithm development

   c) Introduction to various computer languages

   d) Concept of interpreter, compiler, high level language(HLL), machine language (ML) and Assembly Language

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

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

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

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

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

   e) Arrays:
   Single and multi dimensional arrays, character arrays

   f) Pointers:
   To various data types, pointers in parameters passing, pointers to function

g) Structures:
Definition of a structure, pointer to structure, union and array of structure

h) Strings:
String processing, functions and standard library function

i) 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 (4 hrs)

Computer application overview through various applications software related to Electronics Engineering branch viz: ORCAD, PSPICE, OPTSIM, KEIL, Circuit Maker, MATLAB, Electronic Workbench

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. Demonstration of Application software: MATLAB, OPTSIM, PSPICE etc

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 needed 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- Yashwant Kanetkar, BPB Publications, New Delhi
5. Vijay Mukhi Series for C and C++
6. Programming in C by R Subburaj, Vikas Publishhing House Pvt. Ltd., Jangpura, New Delhi
7. Programming in C by Kris A Jansa, Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi
8. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi
9. Elements of C by MH Lewin, Khanna Publishers, New Delhi
10. The Complete Reference to Visual Basic 6, by Noel Jerke, Tata McGraw Hill Education Pvt Ltd, New Delhi
11. Web site www.Beyondlogic.org
12. Pointers in C by Yashwant Kanetkar, BPB Publishers New Delhi
13. Programming in Applications by Chandershekhar, 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 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**

ECOLOGY AND ENVIRONMENTAL AWARENESS CAMP

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

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

1. Basics of ecology, eco system and sustainable development

2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table

3. Sources of pollution - natural and man made, their effects on living and non-living organisms

4. Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms

5. Pollution of air-causes and effects of man, animal, vegetation and non-living organisms

6. Sources of noise pollution and its effects

7. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods, methods of vermicomposting

8. Mining, blasting, deforestation and their effects

9. Legislation to control pollution and protect environment

10. Environmental Impact Assessment (EIA), Elements for preparing EIA statements

11. Current issues in environmental pollution and its control, Global warming
. Green house gases, non-conventional sources of energy, introduction to clean technology.

12. Introduction to Green buildings, site selection, material efficiency, energy efficiency, water efficiency, building form.