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.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Describe and demonstrate the specifications (accuracy, precision, sensitivity, resolution, range, errors, loading effects) of measuring instruments.
- Demonstrate the working principle of measuring instruments like multi-meter, CRO, DSO
- Measure the loading effect of a multi-meter
- Describe the limitation of multi-meter for high frequency measurement
- Measure frequency, voltage, time period and phase using CRO and DSO
- Measure rise time and fall time using CRO and DSO
- Demonstrate the working of RF signal generator, pulse generator
- Identify and differentiate between active and passive transducers and principle of operation of different types transducers.
- Measure distortion of RF signal generator using Distortion factor Meter

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. Transducers (14 hrs)

   - Distinction between active and passive transducers with examples. Basic requirements of a transducer
   - Principle of operation of the following transducers and their applications in measuring the physical quantities listed against each one of them:

i. Variable Resistance Type(strain gauge, thermistor, hygrometer)
ii. Variable capacitance type(pressure gauge, dielectric gauge)
iii. Variable inductance type(LVDT, Burdon pressure gauge)
iv. Others(solid state sensor, thermocouple, piezoelectric device, photoelectric device, proximity probe)

3. Cathode Ray Oscilloscope (12 hrs)

- Construction and working of Cathode Ray Tube(CRT)
- Block diagram description of a basic CRO and triggered sweep oscilloscope, front panel controls
- Specifications of CRO and their explanation
- Measurement of current, voltage, frequency, time period and phase using CRO
- Digital storage oscilloscope (DSO) : block diagram and working principle

4 Voltage, Current and Resistance Measurement (10 hrs)

- Principles of measurement of DC voltage, DC current, AC voltage, AC current,
- Principles of operation and construction of permanent magnet moving coil (PMMC) instruments and Moving iron type instruments,

5 Signal Generators and Analytical Instruments (10 hrs)

- Explanation of block diagram specifications of low frequency and RF generators, pulse generator, function generator
- Distortion factor meter
- Instrumentation amplifier: its characteristics, need and working

6. Digital Instruments (12 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 multi-meter
- Specifications of digital multi-meter and their applications
- Limitations of digital multi-meters.

LIST OF PRACTICALS

1. To observe the loading effect of a multi-meter while measuring voltage across a low resistance and high resistance
2. To observe the limitations of a multi-meter for measuring high frequency voltage

3. Measurement and plot of characteristics of optical devices like photodiodes, photocells.
4. Characteristics of light operated switch using photo-transistor and LDR
5. Measurement of strain using strain gauge.
6. Measurement of temperature using thermistor and thermocouple.
7. Measurement of humidity using humidity meter
8. Measurement of linear and angular displacement
9. Measurement of distortion of RF signal generator using distortion factor meter

Class Project: Fabricate LDR Based light Intensity Control circuit for Street Lights.

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

Topic No	Time Allotted (Hrs)	Marks Allocation (%)
1.	06	09
2.	14	21
3.	12	19
4.	10	16
5.	10	16
6.	12	19
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.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Explain the concept and need of modulation and demodulation
- Measure the modulation index of the Amplitude Modulated wave
- Measure the frequency deviation of FM wave for different modulating signals
- Use different types of modulators and demodulators
- Obtain modulating signal from an AM Detector Circuit
- Obtain modulating signal from a FM Detector
- Use different types of Pulse Modulation Techniques (PAM, PPM, PWM, PCM) and Delta Modulation.

DETAILED CONTENTS

1. Introduction (04 hrs)

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

2. Amplitude modulation (06 hrs)

   - 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 modulation (06 hrs)

- 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 FM signals, Carson's rule.

- Effect of noise on FM carrier. Noise triangle, Role of limiter, Need for pre-emphasis and de-emphasis, capture effect.

- Comparison of FM and AM in communication systems

4. Phase modulation (06 hrs)

- Derivation of expression for phase modulated wave, modulation index, comparison with frequency modulation.

5. Principles of Modulators (10 hrs)
Working principles and typical application as:
- Sqaure Law Modulator
- Balanced Modulator
- Ring Modulator

6. Principles of FM Modulators (06 hrs)

- Working principles and applications of reactance modulator, varactor diode modulator, VCO and Armstrong phase modulator.
- Stabilization of carrier using AFC (Block diagram approach).

7. Demodulation of AM Waves (06 hrs)

- 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.

8. Demodulation of FM Waves (06 hrs)

- Basic principles of FM detection using slope detector
- Principle of working of the following FM demodulators
  i. Foster-Seeley discriminator
  ii. Ratio detector
  iii. Block diagram of Phase locked Loop (PLL) FM demodulators (No Derivation)

9. Pulse Modulation (14 hrs)

- 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)

- Pulse Amplitude Modulation (PAM), Pulse Position Modulation (PPM), Pulse Width Modulation (PWM).

- Pulse code Modulation (PCM): Basic scheme of PCM system, Quantization, Quantization Error. Advantages of PCM systems. Concepts of differential PCM (DPCM)

- 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 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

Class Project: Fabricate any one modulation circuit on PCB or design it in any EDA software and observe its output for different modulating signals.

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, Dhanpat Rai 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, Satya Prakashan, 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 No.	Time Allotted (Hrs)	Marks Allocation (%)
1.	04	05
2.	06	10
3.	06	10
4.	06	10
5.	10	15
6.	06	10
7.	06	10
8.	06	10
9	14	20
Total	**64**	**100**

3.3 DIGITAL ELECTRONICS

L	T	P
4	-	2

RATIONALE

This course 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.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Verify and interpret truth tables for all logic gates.
- Realize all logic functions with NAND and NOR gates
- Design half adder and full adder circuit
- Demonstrate and design 4-bit adder, 2's complement subtractor
- Verify and interpret truth tables for all flip flops.
- Verify and interpret truth tables of multiplexer, de-multiplexer, encoder and decoder ICs
- Design a four bit ring counter and verify its operation
- Design 4-bit SISO, PISO, SIPO, PIPO shift registers

DETAILED CONTENTS

1. Introduction (02 hrs)

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

2. Number System (04 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. Sign magnitude method of representation, 1's and 2's complement method of addition/subtraction, floating point representation

3. Codes and Parity (04 hrs)

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

b) Concept of parity, single and double parity and error detection and correction (Hamming code)
c) Alpha numeric codes: ASCII, EBCDIC and Unicode.

4. Logic Gates and Families (07 hrs)

a) Concept of negative and positive logic
b) Definition, symbols and truth tables of gates. Construction of NOT, AND and OR gates from NAND and NOR gates (universal gates).
(c) Introduction to TTL and CMOS logic families and their sub classification

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)
e) 2-bit comparator

7. Decoders, Multiplexers and De-Multiplexers (06 hrs)

a) Basic functions and block diagram of Encoders and decoders.
b) Basic functions and block diagram of Multiplexers and De-Multiplexers. Different types and ICs.
c) Four bit decoder circuits for 7 segment display and decoder/driver 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, JK and Master/Slave JK flip flops.
c) Difference between a latch and a flip flop
d) Flip flop ICs

9. 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

10. Counters (08 hrs)

a) Introduction to Asynchronous and Synchronous counters
b) Binary up/down counters (upto MOD-8)
c) Decade counter.
d) Pre settable and programmable counters
e) Ring counter with timing diagram
f) Counter ICs

11. Analog to Digital and Digital to Analog Converters (08 hrs)

a) Working principle of A/D and D/A converters
b) Detail study of :
    - Binary Weighted D/A converter
    - R/2R ladder D/A converter

- Brief idea about different techniques of A/D conversion and study of :
    - Stair step Ramp A/D converter
    - Dual Slope A/D converter
    - Successive Approximation A/D Converter
- Performance characteristics of A/D and D/A converter.
- 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
   - Design of a NOR gate latch and verification of its operation

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. To design 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 Circuits and Design by DP Kothari and JS Dhillon, Pearson Publication, New Delhi
4. Digital Electronics by Soumitra Kumar Mandal, Tata McGraw Hill Education Pvt Ltd.
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 BR Gupta, Dhanpat Rai & Co., New Delhi
10. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
11. Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	**Time Allotted (Hrs)**	**Marks Allocation (%)**
1.	2	5
2.	4	5
3.	4	5
4.	7	15
5.	6	10
6.	6	10
7.	6	10
8.	6	10
9	7	10
10.	8	10
11.	8	10
Total	**64**	**100**

3.4 ELECTRONIC DEVICES AND CIRCUITS

L	T	P
4	-	2

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.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Demonstrate the concept of multistage amplifiers and plot the frequency response of the same
- Measure the bandwidth of multistage amplifier
- Describe the operation of large signal amplifiers.
- Demonstrate the concept of negative and positive feedback.
- Measure the gain of emitter follower and push pull amplifiers
- Plot the frequency response of oscillators(Hartley, Colpitt, Wein Bridge)
- Explain the concept of feedback amplifiers
- Plot the frequency response of tuned voltage amplifiers
- Design various wave-shaping circuits(concepts of clipping and clamping)
- Describe the concept of multi-vibrators and operational amplifiers
- Demonstrate the working of operational amplifier as inverter, integrator, differentiator, adder and subtractor.
- Describe the concept of regulated DC supplies and opto-electric devices, VCO and PLL

DETAILED CONTENTS

1. Multistage Amplifiers (08 hrs)

   - Need for multistage amplifier
   - Gain of multistage amplifier
   - Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth

2. Large Signal Amplifier (08 hrs)

   - Difference between voltage and power amplifiers
   - Importance of impedance matching in amplifiers

- Class A, Class B, Class AB, and Class C amplifiers, collector efficiency and Distortion in class A,B,C
- 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 (08 hrs)

- Basic principles and types of feedback
- Derivation of expression for gain of an amplifier employing feedback
- Effect of feedback (negative) on gain, stability, distortion and bandwidth of an amplifier
- RC coupled amplifier with emitter bypass capacitor
- Emitter follower amplifier and its application

4. Sinusoidal Oscillators (08 hrs)

- Use of positive feedback
- Barkhausen criterion for oscillations
- 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 (04 hrs)

- Series and parallel resonant circuits and bandwidth of resonant circuits.
- Single and double tuned voltage amplifiers and their frequency response characteristics

6. Wave Shaping Circuits (04 hrs)

- General idea about different wave shapers
- RC and RL integrating and differentiating circuits with their applications
- Diode clipping and clamping circuits .

7. Multivibrator Circuits (08 hrs)

- Working principle of transistor as switch
- Concept of multi-vibrator: astable, monostable, and bistable and their applications
- Block diagram of IC555 and its working and applications
- IC555 as monostable and astable multi-vibrator

8. Operational Amplifiers (06 hrs)

- Characteristics of an ideal operational amplifier and its block diagram

- Definition of differential voltage gain, CMRR, PSRR, slew rate and input offset current
- Operational amplifier as an inverter, scale changer, adder, subtractor, differentiator, and integrator

9. Regulated DC Power Supplies (08 hrs)

- Concept of DC power supply. Line and load regulation
- Concept of fixed voltage, IC regulators (like 7805, 7905), and variable voltage regulator like (IC 723)

10. VCO (IC 565) and PLL (IC 566) and their Applications (02 hrs)

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 Colpitt's 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) Subtractor iv) Integrator
(11) To realize positive and negative fixed voltage AC power supply using three terminal voltage regulator IC (7805, 7812, 7905)

Class Project: Fabricate any simple operational amplifier circuit (Inverter, Adder, Subtractor etc.) and test it.

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.

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:

Topic No.	Time Allotted (hrs)	Marks Allocation
1.	08	15
2.	08	15
3.	08	15
4.	08	10
5.	04	05
6.	04	05
7.	08	10
8.	06	10
9.	08	10
10.	02	05
Total	**64**	**100**

3.5 ELECTRICAL MACHINES

L	T	P
4	-	2

RATIONALE

Electrical machines is a subject where a student will deal with various types of electrical machines which are employed in industries, power stations, domestic and commercial appliances etc. After studying this subject, diploma holder must be competent to repair and maintain these machines and give suggestions to improve their performance. Practical aspects of the subject will make the students capable of performing various tests on the machines as per latest BIS specifications

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Describe star delta 3-phase connections
- Explain phase, line voltages and current relationships in 3-phase power supply.
- Demonstrate the concept of single phase transformers
- Measure the power and power factor in 3 phase load
- Determine the efficiency of a single phase transformer
- Apply the working principle of rotating electrical machines.
- Demonstrate the working of DC, AC and single phase fractional kilowatt motors.
- Connect and run a DC shunt motor with supply through a 3 point starter

DETAILED CONTENTS

1. Three Phase Supply (06 hrs)

   - Advantage of three-phase system over single-phase system.
   - Star Delta connections
   - Relation between phase and line voltage and current in a three phase system
   - Power and power factor in three-phase system and their measurements by one, two and three wattmeter methods.

2. Transformers (10 hrs)

   Principle of operation and constructional details of single phase transformer
   - Voltage Regulation of a transformer (No Derivation)
   - Losses in a transformer
   - Efficiency, condition for maximum efficiency and all day efficiency
   - CTs and PTs (Current transformer and potential transformer)
   - CVT (Constant Voltage Transformer)

3. Introduction to Rotating Electrical Machines (10 hrs)

- E.M.F induced in a coil rotating in a magnetic field.
- Definition of motor and generator
- Basic principle of a generator and a motor
- Torque due to alignment of two magnetic fields and the concept of Torque angle
- Basic Electromagnetic laws (Faraday's laws of Electromagnetic Induction)

4. DC Machines (14 hrs)

- Principle of working of d.c motors and d.c generator, their constructional details
- Function of the commutator for motoring and generating action
- Factors determining the speed of a DC motor
- Different types of excitation
- Characteristics of different types of DC machines
- Starting of DC motors and starters
- Application of DC machines

5. A.C. Motors (12 hrs)

- Revolving magnetic field produced by poly phase supply
- Brief introduction about three phase induction motors, its principle of operation
- Principle and working of Synchronous Machines
- Application of Synchronous Machines
-

6. Single Phase Fractional Kilowatt Motors (12 hrs)

- Introduction
- Principle of operation of single phase motors
- Types of single phase induction motors and their constructional details
- Single phase synchronous motors – reluctance motor (hysteresis motor)
- Introduction to Commutator type single-phase motors
- Introduction to servo- motors and stepper motors
- Concept of micro-motors.

LIST OF PRACTICALS

Demonstrate various instruments use viz Ammeter, Voltmeter, Wattmeter, p.f meter etc for their identification and and connecting procedure in a circuit.

1. To measure power and power factors in 3 Phase load by two wattmeter method
2. To determine the efficiency of a single phase transformer from the data obtained through open circuit and short circuit test
3. To measure power and power factor of a single phase induction motor.
4. To run a synchronous motor with a.c supply and to measure speed to verify the relation N=12O f/ P
5. To make connections of starting and running winding of a single phase capacitor motor and to run it with the help a DOL starter and to measure its speed
6. Study construction of a stepper and servomotor and to write their complete specifications.

Class Project: Fabricate a transformer using simple iron core and two copper coils and read the output voltage.

INSTRUCTIONAL STRATEGY

A visit to a small factory (Preferably Transformer Factory) must be organised to give live exposure to students. For this the teacher should visit first to understand the assembly line-up which could be followed by a visit of the students in groups of 10-20 (depending upon the size of the factory), where the instructor can give an idea of the working of the factory without much seeking assistance of the factory staff.

RECOMMENDED BOOKS

1) Electrical Machine by SK Bhattacharya, Tata McGraw Hill Education Pvt Ltd, New Delhi

2) Electrical Machines by Nagrath and Kothari, Tata McGraw Hill Education Pvt Ltd, New Delhi

3) Experiments in Basic Electrical Engineering: by S.K. Bhattacharya, KM Rastogi: New Age International (P) Ltd. Publishers, New Delhi

4) Electrical Machines by SK Sahdev, Uneek Publications, Jalandhar

5) Electrical Engineering by JB Gupta, SK Kataria & Sons, New Delhi

6) Electrical Machines by DR Arora, Ishan Publications, Ambala city

7) Electrical Technology Vol. - I and II B.L. Thareja, S Chand and Co. New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Hrs)	Marks Allocation (%)
1.	06	10
2.	10	15
3.	10	15
4.	14	20
5.	12	20
6.	12	20
Total	**64**	**100**

3.6 COMPUTER PROGRAMMING USING C

L	T	P
3	-	4

RATIONALE

Computers play a vital role in present day life, more so, in the professional life of technician engineers. People working in the field of computer industry, use computers in solving problems more easily and effectively. In order to enable the students use the computers effectively in problem solving, this course offers the modern programming language C along with exposition to various applications of computers. The knowledge of C language will be reinforced by the practical exercises.

LEARNING OUTCOME

After undergoing the subject, the students will be able to:

- Identify the problem and formulate an algorithm for it.
- Identify various control structures and implement them.
- Identify various types of variables.
- Use pointer in an array and structure.
- Use structures and union for handling data.
- Explain the concepts of C programming language
- Explain and implement the language constructs concepts
- Install C software on the system and debug the programme
- Explain and execute member functions of C in the programme
- Describe and implement array concept in C programme
- Describe and execute pointers

DETAILED CONTENTS

1. Algorithm and Programming Development (04 hrs)

    1.1 Steps in development of a program
    1.2 Flow charts, Algorithm development
    1.3 Programme Debugging

2. Program Structure (08 hrs)

    2.1 I/O statements, assign statements
    2.2 Constants, variables and data types
    2.3 Operators and Expressions
    2.4 Standards and Formatted
    2.5 Data Type Casting

3. Control Structures (08 hrs)

- 3.1 Introduction
- 3.2 Decision making with IF – statement
- 3.3 IF – Else and Nested IF
- 3.4 While and do-while, for loop
- 3.5 Break. Continue, goto and switch statements

4. Functions (08 hrs)

- 4.1 Introduction to functions
- 4.2 Global and Local Variables
- 4.3 Function Declaration
- 4.4 Standard functions
- 4.5 Parameters and Parameter Passing
- 4.6 Call - by value/reference

5. Arrays (06 hrs)

- 5.1 Introduction to Arrays
- 5.2 Array Declaration, Length of array
- 5.3 Single and Multidimensional Array.
- 5.4 Arrays of characters
- 5.5 Passing an array to function

6. Pointers (06 hrs)

- 6.1 Introduction to Pointers
- 6.2 Address operator and pointers
- 6.3 Declaring and Initializing pointers,
- 6.4 Single pointer,
- 6.5 Pointers to an Array

7. Structures and Unions (08 hrs)

- 7.1 Declaration of structures
- 7.2 Accessing structure members
- 7.3 Structure Initialization
- 7.4 Pointer to a structures,
- 7.5 Unions

LIST OF PRACTICALS

1. Programming exercises on executing and editing a C program.
2. Programming exercises on defining variables and assigning values to variables.
3. Programming exercises on arithmetic and relational operators.
4. Programming exercises on arithmetic expressions and their evaluation.
5. Programming exercises on formatting input/output using printf and scanf and their return type values.
6. Programming exercises using if statement.
7. Programming exercises using if – Else.
8. Programming exercises on switch statement.
9. Programming exercises on do – while, statement.
10. Programming exercises on for – statement.
11. Programs on one-dimensional array.
12. Programs on two-dimensional array.
13. (i) Programs for putting two strings together.
    (ii) Programs for comparing two strings.
14. Simple programs using structures.
15. Simple programs using pointers.
16. Simple programs using union.

INSTRUCTIONAL STRATEGY

The subject is totally practical based. Students should be given clear idea about the basic concepts of programming. In practical session student should be asked to draw flow chart write algorithm and then write program for the algorithm and run on computer. It is required that students should maintain records (files with printouts).

RECOMMENDED BOOKS

1. Let us C by Yashwant Kanetkar
2. Programming in ANSI C by E Balaguruswami, , Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Problem Solving and Programming in C by RS Salaria, Khanna Book Publishing Co(P) Ltd. New Delhi
4. Programming in C by Reema Thareja; Oxford University Press, New Delhi
5. Programming in C by Gottfried, Schaum Series, , Tata McGraw Hill Education Pvt Ltd , New Delhi
6. Exploring C by Yashwant Kanetkar – BPB Publications, New Delhi
7. Programming in C by Stefin G. Coachin
8. Programming in C by R Subburaj, Vikas Publishing House Pvt. Ltd., Jangpura, New Delhi
9. Elements of C by M.H. Lewin, Khanna Publishers, New Delhi
10. Programming in C by Stephen G Kochan
11. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	04	12
2	08	16
3	08	16
4	08	16
5	06	12
6	06	12
7	08	16
Total	**48**	**100**

ENERGY CONSERVATION AWARENESS CAMP

A diploma holder must have knowledge of various tips of energy conservation. Energy conservation has attained priority as it is regarded as additional energy resource. Energy saved is energy produced. This camp covers the basic concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in household appliances and star rating. Lectures will be delivered on following broad topics. There will be no exam for this camp.

1. Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy

2. Introduction to energy management, energy conservation, energy efficiency and its need

3. Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance

4. Standards and Labeling

    - Concept of star rating and its importance
    - Types of product available for star rating

5. Salient Features of Punjab Energy Conservation Building Code (ECBC)

6. General Energy Saving Tips in:

    - Lighting System
    - Room Air Conditioners
    - Refrigerators
    - Water Heater
    - Computers
    - Fans, Heaters, Blowers and Washing Machines
    - Colour Television
    - Water Pumps
    - Kitchens
    - Transport

DRUGS USE AND ABUSE AWARENESS CAMP

Unit 1 Drugs Use and Abuse in Society

a. Concept and overview
b. Extent of the problem
c. Drug use as a social problem
d. Causes of Drug Use: Biological, Socio-cultural, psychological

Unit 2 Types of Dugs and identification of Abuse

a. Familiar drugs: Tabacco, Caffeine, over the counter drugs
b. Restricted Drugs: Opiates, Hallucinogens,Marijuana
c. Reformance enhancing the drugs
d. Uppers and Downers: Stimulants and Depressants

Unit 3 Impact of drug Abuse

a. Individual level biological and psychological
b. Family social, National

Unit 4 Management and prevention of Drug Abuse

a. Medical and psychological
b. Role of family School , Media and Legislation