

## 5.1 CONSUMER ELECTRONICS

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4 - 3

### RATIONALE

The objective of teaching this subject is to give students an in depth knowledge of various electronic audio and video devices and systems. Further this subject will introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices like audio-systems, CD systems. TV, VCR and other items like digital clocks, calculators microwave ovens, photostat machines etc. Which in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

### DETAILED CONTENTS

1. Audio Systems: (10 hrs)
  - 1.1. Microphones and Loudspeakers
    - a) Carbon, moving coil, cordless microphone
    - b) Direct radiating and horn loudspeaker
    - c) Multi-speaker system
  - 1.2 Sound Recording
    - a) Magnetic Recording
    - b) Digital Recording
    - c) Optical Recording ( CD system and DVD)
2. Television
  - 2.1. Monochrome TV (20 hrs)
    - a) Elements of TV communication system
    - b) Scanning and its need
    - c) Need of synchronizing and blanking pulses, VSB
    - d) Composite Video Signal
    - e) Picture Tube
    - f) Camera Tube : Vidicon and Plumbicon
    - g) TV Receiver: Block diagram, function of each block, waveform at input and output of each block.
  - 2.2. Colour Television: (18 hrs)
    - a) Primary, secondary colours
    - b) Concept of Mixing, Colour Triangle
    - c) Camera tube
    - d) PAL TV Receiver
    - e) Concept of Compatibility with Monochrome Receiver

- f) NTSC, PAL, SECAM ( brief comparison)
3. LCD and LED Television: Basic principle and working of LCD & LED TV (04 hrs)
  4. Cable Television: Working of Cable TV, DTH (06 hrs)
  5. Consumer Appliances(Principle and Working): (06 hrs)
    - a) Microwave Oven
    - b) Automatic Washing Machine
    - c) Photostat Machine
    - d) Digital Camera

### LIST OF PRACTICALS

1. To plot the frequency response of a Microphone
2. To plot the frequency response of a Loud Speaker
3. Trouble shooting of CD/DVD Player
4. To observe the wave forms and voltage of B/W TV Receiver.
5. To observe the waveforms and voltages of colour TV Receiver
6. Fault finding of colour T.V
7. Demonstration of Microwave Oven
8. Demonstration and study of DTH System
9. Demonstration of Photostat Machine
10. Demonstration of Automatic Washing Machine

### INSTRUCTION STRATEGY

This subject gives the knowledge of the various day-to-day life electronic products. So, the teacher is required to show and demonstrate the gadgets and impart practical knowledge to the students. For that one should give home assignment and frequent industrial visit should be there. Visit to TV studio and TV transmitter station should be arranged to give a practical exposure to the students

### LIST OF RECOMMENDED BOOKS

1. Audio and Video Systems by RG Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Consumer Electronics by Deepak Arora, Eagle Prakashan, Jalandhar.

3. Colour Television-Principles & Practice by R.R Gulati , Wiley Eastern Limited, New Delhi
4. Complete Satellite & cable Television R.R Gulati New age International Publisher, New Delhi
5. Colour Television Servicing by RC Vijay BPB Publication, New Delhi
6. Colour Television & Video Technology by A.K. Maini CSB Publishers
7. Colour TV by A.Dhake
8. Consumer Electronics by Yagnik & Jain – Ishan Publication
9. Service Manuals, BPB Publication, New Delhi

#### **SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER**

<b>Sr No</b>	<b>Topic</b>	<b>Time Allotted (hrs)</b>	<b>Marks Allocation%</b>
1	Audio System	10	20
2 a	Monochrome TV	20	30
2 b	Colour TV	18	20
3	LCD and LED TV	04	10
5	Cable Television	06	10
6	Consumer Appliances	06	10
<b>Total</b>		<b>64</b>	<b>100</b>

## 5.2 PERSONAL COMPUTER ORGANIZATION (PCO)

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### RATIONALE

Persona; Computers have become a necessity in Industry, offices and becoming popular in homes too. This course gives organization structure and principles of working of various other components like visual display, keyboard drives and printers etc. Diploma holders will find employment in computer industry, Repair and maintenance field.

### DETAILED CONTENTS

1. Mother Board (8 hrs)
 

Introduction to different type of mother boards, Single Board Based System, Block diagram of motherboard. Installation of Computer System.
2. Buses and Ports (8 hrs)
 

Different type of Buses PCI, SCSI and Serial and Parallel ports (COM ports) Ports COM 1, LPT1, USB. RS 232 C, use of computer for instrumentation.
3. Memory (8 hrs)
 

Principle and Construction of Floppy Disk Drive and Hard Disk Drive (HDD). Floppy Disk Controller & Hard Disk Controller. Pen Drives, common faults with hard disk drive and floppy disk drive, RAM Module.
4. Keyboard and Mouse (8 hrs)
 

Block Diagram of keyboard Controller, keyboard switches, keyboard faults, mouse, common faults with mouse. Introduction to scanner, digitizer.
5. CRT Display Devices (8 hrs)
 

Block Diagram, Principle of operation of Computer Monitor, Difference between TV & Computer Monitor. Video display Adaptors (monochrome and Colour), introduction to solid state displays
6. Printers (8 hrs)
 

Printing Mechanism, Construction and working principles of Dot Matrix Printer, Inkjet Printer, Laser Printer, Printer Controller, Centronics Interface, Signals from PC to Printer and Printer to PC.

## **LIST OF PRACTICALS**

Operation, Maintenance, Installation and Testing of the following devices:

- 1 Keyboard
- 2 Mouse
- 3 Monitors
- 4 FDD
- 5 HDD, Partitioning and Formatting
- 6 DOT Matrix Printer
- 7 Laser Printer
- 8 Mother board (Pentium and Celeron), CMOS Set up.
- 9 CD-ROM and DVD-ROM
- 10 Connectors and Cables
- 11 MODEM
- 12 Installation of any operating system.
- 13 SMPS
- 14 Specifications, maintenance and repair of CVTs and UPS

## **INSTRUCTIONAL STRATEGY**

This subject gives complete knowledge regarding the Computer Hardware. Teacher must give hands on practice related to operation, maintenance, installation etc. Teacher should encourage the students to do assembly of PC.

## **RECOMMENDED BOOKS**

1. PC Organisation by S. Chowdhury, Dhanpat Rai & Sons, Delhi
2. Personal Computer Organisation by Gourav Gupta, Eagle Prakashan, Jalandhar.
3. IBM PC Colons by Govinda Rajalu, Tata McGraw Hill Education Pvt Ltd, New Delhi
4. Text Book by Mark Minasi
5. P.C. Organinsation by Priti Srivastv- Ishan Publications
6. Computers by P.Norton

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER**

<b>Sr No</b>	<b>Topic</b>	<b>Time Allotted (hrs)</b>	<b>Marks Allocation%</b>
1	Mother Board	08	20
2	Buses and Ports	08	15
3	Memory	08	15
4	Keyboard and Mouse	08	15
5	CRT Display Devices	08	20
6	Printers	08	15
<b>Total</b>		<b>48</b>	<b>100</b>

## 5.3 TROUBLE SHOOTING OF ELECTRONIC EQUIPMENT

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### RATIONALE

The course provides the students with necessary knowledge and competency to diagnose the faults for trouble shooting and for systematic repair and maintenance of electronic equipment and testing of components.

**NOTE: Students are to be given the awareness about the following topics during the Laboratory Work. There will not be any theory examination.**

### TOPICS TO BE DISCUSSED

#### 1. Repair, Servicing and Maintenance Concepts

Introduction, Modern electronic equipment, Mean time between failures (MTBF), Mean time to repair (MTR), Maintenance policy, potential problems, preventive maintenance, corrective maintenance.

- a) Study of basic procedure of service and maintenance
- b) Circuit tracing techniques
- c) Concepts of shielding, grounding and power supply considerations in instruments.

#### 2. Fundamental Trouble Shooting Procedures

##### i) Fault location

##### ii) Fault finding aids

- Service manuals
- Test and measuring instruments
- Special tools

##### iii) Trouble Shooting Techniques

- Functional Areas Approach
- Split half method
- Divergent, convergent and feedback path circuit analysis
- Measurement techniques

#### 3. Mobile Phones

- Identification of various parts of mobile phones
- Repair and maintenance of mobile phones
- Software installation in mobile phones
- Common faults

4. Trouble shooting and maintenance of testing equipment like C.R.O , function generator, power supplies and other measuring devices, detailed discussion about trouble shooting of medical, electronic equipment like, ECG, EEG, Ultra sound. Repair and maintenance and exposure of medical electronics equipment through industrial visits.
5. Troubleshooting Digital Systems  
Typical faults in digital circuits. Use of logic clip, logic pulsar, IC tester
6. Demonstration and practicals to be performed on following groups of Electronic equipment, Choice of one equipment from each group is compulsory.

<b>Group-I Communication</b>	<b>Group-II Consumer</b>	<b>Group-III Audio-video</b>	<b>Group-IV Computer</b>
Telephone Handsets.	Inverters/UPS Emergency Lights	TV, CRT, LCD/HD	Monitor
Cordless Phones	Stabilizers	VCD, DVD Players	Printer (Laser)
Fax Machine	EPABX	CCTV	Printer (Inkjet)
Modem	Hub/Switches	Audio Systems	Scanner
Walkie / Talkie	Electronic Toys		Keyboard, Mouse
			Video Games

### **LIST OF PRACTICALS**

1. Demonstration and practice of fault finding and repair of mobile telephones
2. Demonstration and practice of fault finding and repair of:
  - (a) C.R.O
  - (b) Function Generator
  - (c) Power supplies
  - (d) Digital multimeter
3. Demonstration, practice of fault finding and repair of any one equipment from group-I i.e. Communication
4. Demonstration, practice of fault finding and repair of any one equipment from group-II i.e. Consumer
5. Demonstration, practice of fault finding and repair of any one equipment from group-III i.e. Audio/Video systems

6. Demonstration , practice of fault finding and repair of any one equipment from group IV i.e. Computer
7. Testing of Integrated Circuits (ICs)
8. Use of digital tools for troubleshooting digital equipments

### **RECOMMENDED BOOKS**

1. Repair Manuals
2. Specifications of Equipment supplied by the manufacturer
3. Introduction to Biomedical Equipment Technology – Joseph J. Carr and John M Brown.
4. Principles of Biomedical Instrumentation and measurement – Richard Aston.
5. Introduction to Biomedical Equipment Technology by Carr and Brown, Regents and Prentice Hall of India, New Delhi
6. Principles of Bio-medical Instrumentation and Measurements by Leslie Cromwell, Fred J Weibell, Erich A Pfeiffer Prentice Hall of India, New Delhi
7. Handbook of Biomedical Engineering- R.S. Khandpur.
8. Modern Electronic Equipment Trouble shooting, Repair and Maintenance by RS Khandpur, Tata McGraw Hill Education Pvt Ltd, New Delhi
9. Bio-medical Instrumentation by M Arumugam, Anuradha agencies Publishers, Vidayakaruppur, Kumbakonam RMS

## 5.4 COMMUNICATION SYSTEMS – II

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### RATIONALE

This course deals with the advanced digital and data communication techniques beyond the conventional communication. It involves the use of modems in synchronous and asynchronous data transmission. It encompasses the modern communication network and integrated services like ISDN and Radio paging along with cellular mobile telephones, FAX, electronic exchanges etc. so vital for present day communication.

### DETAILED CONTENTS

1. Introduction: (04 hrs)  
Basic block diagram of digital and data communication systems. Their comparison with analog communication systems.
2. Coding (08 hrs)
  - a) Introduction to various common codes 5 bit Baudot code, 7 bit ASCII, ARQ, EBCDIC
  - b) Code error detection and correction techniques - Redundancy, parity, block check character (BCC), Vertical Redundancy check (VRC), Longitudinal Redundancy Check (LRC), Cyclic Redundancy check (CRC), Hamming code
3. Digital Modulation Techniques: (14 hrs)
  - a) Basic block diagram and principle of working of the following:
    - Amplitude shift keying (ASK): Interrupted continuous wave (ICW), two tone modulation
    - Frequency Shift keying (FSK)
    - Phase shift keying (PSK), Quadrature Phase Shift Keying(QPSK)
    - Spread Spectrum Techniques, Frequency Hopping Technique
4. Characteristics/working of data transmission circuits; bandwidth requirements, data transmission speeds, noise, cross talk, echo suppressors, distortion, equalizers (06 hrs)
5. UART, USART: (06 hrs)  
Their need and function in communication systems
6. Modems: (08hrs)  
Need and function of modems, Mode of modems operation (low speed, medium speed and high speed modems). Modem interconnection, Modem data transmission speed, Modem modulation method, Modem interfacing (RS 232 Interface, other interfaces).

7. Telemetry: (06 hrs)  
Radio-telemetry, and its application. Block diagram of TDM and FDM telemetry system
8. Electronic Exchange: (08 hrs)
- Typical telephone network. Various switching offices (Regional Centre, District Centre, Toll Centre, Local Office) and their hierarchy.
  - Principles of space division switches. Basic block diagram of a digital exchange and its working.
  - Combined space and time switching: Working principle of STS and TST switches.
  - Functions of the control system of an automatic exchange. Stored programme Control (SPC) processor and its application in electronic exchange and rural telephone exchange.
  - Introduction to PBX, PABX and EPABX.
- 9.. Facsimile (FAX) (04 hrs)  
Basic idea of FAX system and its applications. Principle of operation and block diagram of modern FAX system. Important features of modern FAX machines.

### LIST OF PRACTICALS

1. Transmission of Hamming code on a serial link and its reconversion at the receiving end.
2. Observe wave forms at input and output of ASK and FSK modulators
3. To transmit parallel data on a serial link using USART
4. Transmission of data using MODEM.
5. Observe wave forms at input and output of a TDM circuit
6. To study the construction and working of a telephone handset
7. To study the construction and working of a FAX machine.
8. To study the construction and working of an EPABX.

### NOTE:

Visits to the sites of all types of telephone exchanges (including mobile and rural exchanges), FAX and Carrier telephony should be made with a view to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating the dates and locations of their visits.

## INSTRUCTIONAL STRATEGY

This subject provides information to the students regarding the various techniques used in Digital and Data Communication. Emphasize be made in the laboratory during the conduct of experiments. For the better awareness taking around the world, visit must be arranged to the industries. Like telephone exchange, various cellular industries etc.

## RECOMMENDED BOOKS

1. Electronic Communication Systems By George Kennedy Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Communication Systems-II by Yogesh Chhabra
3. Communication system By A.K. Gautam S.K. Kataria Sons, Delhi
4. Communication System – II by Priti Srivastv – Ishan Publications
5. Electronics communication by K.S. Jamwal, Dhanpat Rai and Sons, Delhi

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	Introduction	04	5
2	Coding	08	10
3	Digital Modulation Techniques:	14	20
4	Characteristics/working of data transmission circuits;	06	10
5	UART, USART:	06	10
6	Modems	08	10
7	Telemetry	06	10
8	Electronic Exchange	08	15
9	Facsimile (FAX)	04	5
	<b>Total</b>	<b>64</b>	<b>100</b>

## 5.5 MICROCONTROLLERS AND EMBEDDED SYSTEM

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### RATIONALE

Embedded systems and Micro-controllers have also assumed a great significance in the electronic and consumer goods industry and are a very vital field. The subject aims expose students to the embedded systems besides giving them adequate knowledge of Micro controllers.

### DETAILED CONTENTS

1. Microcontroller series (MCS) – 51 Overview (14 hrs)
  - Architecture of 8051/8031 Microcontroller
    - Pin details
    - I/O Port structure
    - Memory Organization
    - Special Function Registers (SFRs)
    - External Memory
  
2. Instruction Set; Addressing Modes, Instruction types (14 hrs)
  - Timer operation
  - Serial Port operation
  - Interrupts
  
3. Assembly/C programming for Micro controller (14 hrs)
  - Assembler directives
  - Assembler operation
  - Compiler operations
  - De bugger
  - Simulator
  
4. Design and Interface (12 hrs)
 

Examples like: keypad interface, 7- segment interface, LCD, stepper motor. A/D, D/A, RTC interface.
  
5. Introduction of PIC Micro controllers (04 hrs)
6. Application of Micro controllers in Communication System (06 hrs)

## LIST OF PRACTICALS

1. Familiarization with Micro-controller Kit
2. Assembly Language Programming (PC Based)
3. C Language Programming- (PC Based)
4. Write Program for LCD interface.
5. Write Program for A/D converter, result on LCD.
6. Write Program for D/A converter, result on LCD.
7. Write a Program for serial data transmission from Kit to PC.
8. Application of micro controllers in GSM.
9. Program to Interface Sensors.

## INSTRUCTIONAL STRATEGY

More emphasis while teaching this subject should be given on practical aspects along with the theory input. Lots of programming exercises may be given to the students. Mini-projects based on microprocessor and micro-controller operations may be identified and given to students as assignments.

## RECOMMENDED BOOKS:

1. Microcontrollers by Deshmukh, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Micro Controller & Embedded System by Deepak Arora, Eagle Prakashan, Jalandhar.
3. Microcontrollers by Ayala
4. Microcontrollers by Mazidi, Pearson Education, Delhi
5. Microcontrollers by Neil Makanzi, Pearson Education, Delhi
6. Embedded GSM Applications
7. Microcontrollers and Embedded Systems by Sangar and Sahdev, Uneek Publications, Jalandhar
8. Microcontroller & Embedded system- by Sanjeev Gupta- Ishan Publication
9. Embedded Systems Architecture, Programming and design by Raj Kamal, Tata McGraw Hill Education Pvt Ltd, New Delhi

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No.	Topic	Time Allotted (hrs)	Marks Allocation
1.	Micro controller series (MCS) – 51 Overview	14	20
2.	Instruction Set; Addressing Modes, Instruction types	14	20
3.	Assembly language programming/C	14	25
4.	Design and Interface	12	20
5.	Introduction of PIC micro controllers	4	5
6.	Application of Micro controllers in Communication System	6	10
<b>Total</b>		<b>64</b>	<b>100</b>

## 5.6 INSTRUMENTATION AND PROGRAMMABLE LOGIC CONTROLLERS

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### RATIONALE

This subject deals with the various instruments, their construction and working which control the various parameters and operations in any industry. A diploma holder in the field of Electronics employed for maintenance of electronic equipment/ gadgets is required to diagnose faults, rectify them and test the total system for good performance. Thus there is a need of introducing diploma holders to the basics of Instrumentation.

In industry, many manufacturing processes demand a sequence of operation, which are to be performed repetitively. Early automation systems were mechanical in design, timing and sequencing being effected by gears and cams. Slowly these design concepts were replaced by electrical drives which were controlled by relays and now by programmable logic controllers (PLCs). A PLC is a solid state device, designed to operate in noisy industrial environments and can perform all logic functions. PLCs are widely used in all industries for efficient control operations. A diploma holder in industry is called upon to design , modify and troubleshoot such control circuits. Looking at the industrial applications of PLCs in the modern industry, this subject finds its usefulness in the present curriculum.

### DETAILED CONTENTS

1. Introduction to instrumentation (02 hrs)  
Basic Measurement System, functions of its elements namely the transducer, signal conditioner, display or read-out and power supply.
2. Transducers (4 hrs)
  - a) Distinction between active and passive transducers with examples. Basic requirements of a transducer
  - b) Principle of operation of the following transducers and their applications in measuring the physical quantities listed against each one of them.

<b>Transducer</b>	<b>Physical quantities</b>	
c) Variable Resistance Type		(08 hrs)
- Potentiometric Resistance device	Displacement and force	
- Strain gauge	Torque and displacement	
- Thermistor	Temperature	
- Resistance hygrometer	Humidity	

- d) Variable capacitance type (04 hrs)
- Variable capacitance Displacement and pressure
  - Pressure gauge
  - Dielectric gauge Liquid Level and thickness
- e) Variable inductance type (04 hrs)
- LVDT Pressure force, displacement and position
  - Burdon pressure gauge Pressure force, displacement pressure, force, displacement
  - Strain gauge
- f) Other Types (06 hrs)
- Solid State Sensor Temperature
  - Thermocouple Temperature
  - Piezoelectric device Force
  - Photoelectric devices Light
  - Proximity probes r.p.m
  - Digital transducer displacement
  - Bimetallic thermometer Temperature
  - Basic principles of Magnetic and ultrasonic How meters Flow
3. Signal Conditioners (06 hrs)
- Characteristics of instrumentation amplifiers in aspect of input impedance, output impedance, drift, dc offset, noise, gain, common mode rejection ration, frequency response, relating to suitability of these characteristics for amplifying signals from various transducers. Need and working of a typical isolation amplifier
4. Output Devices and Displays (04 hrs)
- Basic principles of operation, constructional features and application of the following:
- a) Graphic Recorder
  - b) X-Y Recorder
5. Introduction to PLCs (06 hrs)
- What is PLC, limitations of relays. Advantages of PLCs over electromagnetic relays, Different programming languages, PLC manufacturer etc.

6. Working of PLC (06 hrs)
- Basic operation and principle of PLC,
  - Architectural details – Processor
  - Memory structure, I/O Structure
  - Programming terminal, Power Supply
7. Instruction Set (06 hrs)
- Basic instructions like latch, master control self holding relays.
  - Timer instructions like on-delay timers, off-delay timers, retentive timers, resetting of timers.
  - Counter instructions like up-counter, down counter, resetting of counters.
  - Sequencers, output sequencers, input sequencers time driven and event driven sequencers masking etc.
  - Comparison instruction like equal, not equal, greater, greater than equal, less than, less than equal mask equal, limit etc.
8. Ladder diagram programming (04 hrs)
- Programming based on Basic instructions, timer counter, sequencer to comparison instruction using ladder diagrams.
9. Applications of PLCs (04 hrs)
- Assembly
  - CNC Machines
  - Packaging
  - Process controls
  - Car parking
  - Doorbell operation
  - Traffic light control
  - Sorting of objects etc
  - Microwave Oven
  - Washing machine

### **LIST OF PRACTICALS**

1. Measurement and plot of characteristics of optical devices like photodiodes, photocells.
2. Characteristics of light operated switch using photo-transistor and LDR
3. Measurement of strain using strain gauge.
4. Measurement of temperature using thermistor and thermocouple.
5. Measurement of humidity using humidity meter

6. Measurement of linear and angular displacement
7. To assemble and test instrumentation amplifier measure its gain, input and output impedance.
8. Study an X-Y records and graphic recorder
9. Measurement of pressure using Bourdon Tube.

### **PLCs**

1. Familiarization with the working of PLC
2. Components/sub-components of a PLC, learning functions of different modules of a PLC system
3. Introduction to step 5 programming language, ladder diagram concepts, instruction list syntax
4. Basic logic operations, AND, OR, NOT, functions
5. Logic control systems with time response as applied to clamping operation
6. Sequence control system e.g in lifting a device for packaging and counting
7. Use of PLC for various mechanical outputs viz motion of a piston in a single cylinder multiple cylinders, driving machine operation etc.
8. Familiarization of the working of PLC
9. Writing, entering and testing programs using a hand-held programmer and computer for the following operations
  - Ladder Logic
  - Timers
  - Counters
  - Sequencers

### **INSTRUCTIONAL STRATEGY**

The teacher should explain the scope of various measuring devices and their practical application in the field. The transducers and measuring devices must be shown to the students and they should be trained in the selection, operation, maintenance and calibrations. Frequent visits to nearby process industries will be of immense help to the students. The inputs shall start with theoretical inputs to architecture, instruction set, assembly language programming, Small projects may be identified, be designed and implemented. PLC ladder diagram and programming should be supplemented with visits to industry. More emphasis may be given to practical work.

## RECOMMENDED BOOKS

1. Electrical and Electronic Instrumentation and Measurements by A.K. Sawhney, Dhanpat Rai and Co, New Delhi.
2. Instrumentation and PLC by Deepak Arora, Eagle Prakashan, Jalandhar.
3. Electronic Instrumentation by HS Kalsi, Tata McGraw Hill Education Pvt Ltd, New Delhi
4. Electronic Instrumentation by Cooper, Prentice Hall of India, New Delhi
5. Transducers by Peter Norton
6. Mechanical and Industrial Measurements by R.K. Jain, Khanna Publishers, New Delhi
7. Fundamentals of Industrial Instrumentation and Process Control by Dunn, Tata McGraw Hill Education Pvt Ltd, New Delhi
8. Process Control Instrumentation Technology by Johnson, Curits; EE Edition, Prentice Hall of India, New Delhi
9. Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA
10. Introduction to PLCs by Gary Dunning. McGraw Hill
11. Module on PLCs and their Applications by Rajesh Kumar, NITTTR Chandigarh
12. Module on "Allen Bradlag PIC (SLC 500), Institution set-1, by Rajesh Kumar, NITTTR, Chandigarh
13. Instrumentation & Plc by Ms Anju – Ishan Publication
14. Module on "PLC Applications based on SLC 5/03" By Rajesh Kumar, NITTTR Chandigarh

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Sr No	Topic	Time Allotted (hrs)	Marks Allocation%
1	Introduction to instrumentation	02	5
2	Transducers	26	35
3	Signal Conditioners	06	10
4	Output Devices and Displays	04	5
5	Introduction to PLCs	06	15
6	Working of PLC	06	15
7	Instruction Set	06	5
8	Ladder diagram programming	04	5
9.	Applications	04	5
<b>Total</b>		<b>64</b>	<b>100</b>

## **PERSONALITY DEVELOPMENT CAMP**

This is to be organized at a stretch for two to three days during fifth or sixth semester. Extension Lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this subject.

1. Communication Skills
2. Correspondence and job finding/applying/thanks and follow-up
3. Resume Writing
4. Interview Techniques: In-Person interviews; telephonic interviews, panel interviews; group interviews and video conferencing etc.
5. Presentation Techniques
6. Group Discussions Techniques
7. Aspects of Personality Development
8. Motivation
9. Leadership
10. Stress Management
11. Time Management
12. Interpersonal Relationship
13. Health and Hygiene