

## 5.1 CONSUMER ELECTRONICS AND TROUBLESHOOTING

L T P  
Periods/Week 3 1 4

### 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 and other items like 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: (08 Periods)
  - 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)
  - 1.3. Study of VCD and DVD Player systems.
2. Television
  - 2.1. Monochrome TV (14 Periods)
    - a) Scanning and its need
    - b) Need of synchronizing and blanking pulses, VSB
    - c) Composite Video Signal
    - d) Picture Tube
    - e) Camera Tube : Vidicon and Plumbicon
    - f) TV Receiver: Block diagram, function of each block, waveform at input and output of each block.
  - 2.2. Colour Television: (12 Periods)
    - a) Primary, secondary colours
    - b) Concept of Colour Mixing, Colour Triangle
    - c) Camera tube
    - d) PAL TV Receiver
    - e) Concept of Compatibility with Monochrome Receiver
    - f) NTSC, PAL, SECAM system (brief comparison)
3. LCD and LED Television: Basic principle and working of LCD & LED TV (06 Periods)
4. Cable Television: Concept and Working of Cable TV, DTH, HDTV (06 Periods)

5. Consumer Appliances- Principle, Working and troubleshooting with special emphasis on control panel (10 Periods)
- a) Microwave Oven
  - b) Washing Machine
  - c) Photostat Machine
  - d) DTH System
  - e) Digital Camera
6. a) Repair, Servicing and Maintenance Concepts (8 Periods)

Mean time between failures (MTBF), Mean time to repair (MTR), Maintenance policy, potential problems, preventive maintenance and corrective maintenance.

b) 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

### LIST OF PRACTICALS

1. To plot the directivity pattern and frequency response of a microphone.
2. To plot the directivity pattern and frequency response of a loudspeaker.
3. Demonstration of VCD/DVD player and study of its transport mechanism.
4. Familiarization with the different sections of B/W TV Receiver.
5. To observe the wave forms and voltage of B/W and colour TV Receiver.
6. Fault finding of colour T.V Receiver.
7. Familiarization with different section of LCD & LED TV
8. Study of cable TV network system.
9. Demonstration and Operation of Control Panel
  - (a) Microwave Oven
  - (b) DTH System
  - (c) Photostat Machine
  - (d) Washing Machine

### INSTRUCTIONAL 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.

## RECOMMENDED BOOKS

1. Audio and Video Systems by RG Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Colour Television-Principles & Practice by R.R Gulati , Wiley Eastern Limited, New Delhi
3. Complete Satellite & cable Television R.R Gulati New age International Publisher, New Delhi
4. Colour Television Servicing by RC Vijay BPB Publication, New Delhi
5. Colour Television & Video Technology by A.K. Maini CSB Publishers
6. Colour TV by A. Dhake
7. Service Manuals, BPB Publication, New Delhi
8. Modern Electronic Equipment Trouble shooting, Repair and Maintenance by RS Khandpur, Tata McGraw Hill Education Pvt Ltd, New Delhi

## SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allocation%
1	08	15
2 a	14	15
2 b	12	20
3	06	10
4	06	10
5	10	20
6	08	10
Total	<b>64</b>	<b>100</b>

## 5.2 MICROWAVE COMMUNICATION

L T P  
Periods/ Weeks 4 - 2

### RATIONALE

This subject includes an exposure to microwaves engineering, radar systems, fibre optics and satellite communication. In microwaves industry, job opportunities are available in of assembly, production, installation, repair and maintenance of microwave transmitters and receivers. The knowledge of radar systems allows opportunities with civil and defence organizations dealing with aircraft and shipping. Fibre optics is the latest thrust area in communication with vast opportunities in the private sector.

### DETAILED CONTENTS

1. Introduction to Microwaves (04 Periods)

Introduction to microwaves and its applications, Classification on the basis of its frequency bands (HF, VHF, UHF, L, S, C, X, KU, KA, mm, SUB, mm)

2. Microwave Devices (12 Periods)

Basic concepts of thermionic emission and vacuum tubes, Effects of interelectrode capacitance, Lead Inductance and Transit time on the high frequency performance of conventional vacuum tubes, and steps to extend their high frequency operations.

Construction, characteristics, operating principles and typical applications of the following devices (No mathematical treatment)

- Multi cavity klystron
- Reflex klystron
- Multi-cavity magnetron
- Traveling wave tube
- Gunn diode
- Impatt diode

3. Wave guides (08 Periods)

Rectangular and circular wave guides and their applications. Mode of wave guide, Propagation constant of a rectangular wave guide, cut off wavelength, guide wavelength and their relationship with free space wavelength (no mathematical derivation). Impossibility of TEM mode in a wave guide.

4. Microwave Components (10 Periods)

Constructional features, characteristics and application of tees, bends, matched termination, twists, detector, mount, slotted section, directional

coupler, fixed and variable attenuator, isolator, circulator and duplex, coaxial to wave guide adapter.

5. Microwave antennas (06 Periods)

Structure characteristics and typical applications of Horn and Dish antennas

6. Microwave Communication systems (10 Periods)

- Basic idea of different modes of radio wave propagation, ground wave propagation space wave communication and sky wave propagation
- Explanation of terms – critical frequency, maximum usable frequency, skip distance, Noise in radio communication, signal fading
- Block diagram and working principles of microwave communication link.
- Troposcatter Communication: Troposphere and its properties, Tropospheric duct formation and propagation, troposcatter propagation.

7. Radar Systems (08 Periods)

- Introduction to radar, radar range equation (no derivation), its various applications,.
- Block diagram and operating principles of basic pulse radar. Concepts of ambiguous range, radar area of cross-section and its dependence on frequency.
- Block diagram and operating principles of CW (Doppler) and FMCW radars.
- Block diagram and operating principles of MTI radar.

8. Satellite Communication (06 Periods)

- Basic Idea of passive and active satellite. Meaning of the term orbit, apogee, perigee.
- Geo Stationary satellite. Block diagram and explanation of a satellite communication link. Link losses.
- Transponders, , VSAT and its features.

## LIST OF PRACTICALS

1. To measure electronics and mechanical tuning range of a reflex klystron
2. To measure VSWR of a given load.
3. To measure the Klystron frequency by slotted section method
4. To measure the directivity and coupling of a directional coupler.
5. To plot radiation pattern of a horn antenna in horizontal and vertical planes.

6. To verify the properties of tee.
7. To carry out installation of a dish antenna.
8. Study of satellite communication system

**NOTE:**

Visit to the appropriate sites of microwave industries, radar installations and communication stations should be made 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**

Microwave and radar is a very important subject and requires both theoretical as well as practical exposure. The teaching should be supplemented by visits to the microwave stations and using suitable audio visual aids.

**RECOMMENDED BOOKS**

1. Microwave Devices and Components by Samuel Y. Liao, Prentice Hall of India, New Delhi
2. Electronics Communication by Roddy and Coolen
3. Electronics Communication System by KS Jamwal, Dhanpat Rai and Sons, Delhi
4. Microwave Engineering by Das, Tata McGraw Hill Education Pvt Ltd , New Delhi

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic</b>	<b>Time Allotted (Periods)</b>	<b>Marks Allotted (%)</b>
1	04	05
2	12	20
3	08	10
4	10	15
5	06	10
6	10	15
7	08	15
8	06	10
<b>Total</b>	<b>64</b>	<b>100</b>

## 5.3 ADVANCED MICROPROCESSORS

L T P  
Periods/ Weeks 4 - 4

### RATIONALE

The complex systems require high through put that at times is not met with 8-bit microprocessor system. So, 16 bit up based system become suitable. They provide better facilities to personal computers and other automatic process control systems.

### DETAILED CONTENTS

1. The 8086 Microprocessor (08 Periods)
  - Internal Architecture of 8086.
  - Memory organisation: Memory segmentation & physical address generation.
  - 8086 Flags
2. 8086 Signal (12 Periods)
  - Pins and Signals description.
  - CLK circuitry.
  - 8086 Address and Data bus Concept
  - Maximum & Minimum mode.
  - Memory and I/O Interface block diagram
  - Types of interrupts and interrupt priority. (Brief Idea)
3. 8086 Instruction set (12 Periods)
  - Instruction Format : Example on Mov instruction only.
  - Instruction : Data transfer, Arithmetic, Bit & Logical manipulation, String, Program transfer and processor control instructions.
  - Addressing mode & its types.
  - Macros , Procedure.
4. Directives and Programming (12 Periods)
  - Editor, Assembler, Emulators, Directives.
  - Programs: Addition, Subtraction, Multiplication, Division, Shifting of data right / Left, Increment, Decrement, Complement, Block movement of data.
5. Interrupts (12 Periods)
  - 8086 Interrupt.
  - Interrupt Vector table, Vector & Non Vector Interrupt.
  - Predefined Interrupts ( 0 – 4 )
  - User defined Software/Hardware Interrupts.
6. Latest Microprocessor (08 Periods)

Introduction to 32 bit Microprocessor, Features and advantages of Pentium processor/  
Dual core processor and RISC processor

## LIST OF PRACTICALS

1. To Study the Architecture of 8086 microprocessor.
2. Familiarization of different keys of 8086-microprocessor kit and its memory map.
3. Steps to enter, check /modify data or program and to execute a program on 8086 Microprocessor kit.
4. Addition of two 8 bit numbers.
5. Addition of two 16 bit numbers
6. Subtraction of two 8 bit numbers.
7. Subtraction of two 16 bit numbers
8. Multiplication of two 8 bit numbers
9. Division of two 8 bit numbers
10. Program for And, OR, X-OR & its complement.
11. Determine the Hex code of Mov instruction for various addressing mode.
12. Determine the Physical address for different segments.

## INSTRUCTIONAL STRATEGY

Advanced Microprocessor gives the knowledge of 8086 and latest microprocessors. So, the teaching process require the theoretical study of microprocessors and also practical implementation using the microprocessor kits.

## RECOMMENDED BOOKS

1. Microprocessor and Application by D.V. Hall.
2. Microprocessor 8086/88 by B.B. Brey
3. Microprocessors & Micro controllers by Dr. B.P. Singh
4. Microprocessor by Rajiv Sapra, Ishan Publications, Ambala
5. Microprocessor by Naresh Grover
6. Microprocessors and Microcomputers and their Applications by AK Mukhopadhyay
7. Microprocessors and Applications by Uffenback
8. Introduction to Microprocessor by Adithya Mathur, Tata McGraw Hill Publishing Co, New Delhi
9. Microprocessor Architecture, Programming and Applications with 8085 by RS Gaonkar, Wiley Eastern Ltd, New Delhi
10. Microprocessor and Applications by B Ram
11. Microprocessor by SK Goel

## SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	08	10
2	12	20
3	12	20
4	12	20
5	12	20
6	08	10
<b>Total</b>	<b>64</b>	<b>100</b>



## 5.4 ELECTRONICS IN INDUSTRY

L T P  
Periods/ Weeks 3 - 4

### RATIONALE

This course deals with electronic devices and circuits used in industry. It involves the study of thyristors, rectifier circuits, communication circuits and also the application of electronics in industry.

### DETAILED CONTENTS

1. Thyristors and Other Power Electronics Devices (30 Periods)
  - 1.1 Introduction
  - 1.2 Applications
  - 1.3 Symbolic Representations
  - 1.4 Specifications
  - 1.5 Principle of Operating of an SCR
  - 1.6 Two-Transistor Analogy of SCR
  - 1.7 DIAC
  - 1.8 TRIAC
  - 1.9 Basic Triggering circuits for Thyristors
  - 1.10 Rectifier Circuits using SCR
  - 1.11 Construction and working of Gate Turn Off (GTO) thyristor
  - 1.12 Characteristics of Programmable Uni-junction Transistor (PUT), ASCR, LASCR, RCT, SCS
  - 1.13 Construction and Working of IGBT
  
2. Power Electronics Circuits (18 Periods)
  - 2.1 Commutation Circuits
  - 2.2 Inverters series and parallel
  - 2.3 Choppers: Step up, Morgan's, Jones's
  - 2.4 Single phase and Three Phase Converters.
  
3. Module 03- Application of Electronics in Industry/ Sector (Not to include in theory) (2 weeks)
  - a. Process Industry- i) Chemical Industry ii) Sugar iii) Paper iv) Paint v) Steel vi) Fertilizer vii) Glass viii) Textile ix) Rubber
  - b. Medical and Pharmaceutical Industry
  - c. Computer Manufacturing Industry
  - d. Consumer Goods Industry
  - e. Service Sector
  - f. Power Generation and Transmission Industry
  - g. Communication Service providing Organisation as BSNL, Reliance, Airtel, Idea, Government Telecommunication Department etc
  - h. Defence Sector
  - i. Space Organisation
  - j. Petroleum Industry

Student will get the exposure of equipments, flow diagram of organisation setup maintenance and service of any of 4 above industry/ sector. And will submit the report and the evaluation will be based on viva-voice.

### LIST OF PRACTICALS

1. Testing of components- SCR, DIAC, TRIAC
2. To plot and verify Characteristic of an SCR
3. To plot and verify Characteristic of an TRIAC
4. To plot V-I characteristics of UJT
5. To plot V-I characteristics of DIAC
6. Assembly and testing of Half-wave Gate-controlled Rectifier using One SCR
7. Assembly and testing of Single-phase Half-controlled Full-wave Rectifier using two SCRs and two Diodes
8. Assembly and testing of Illumination/ Fan Control circuit using SCR
9. Assembly and testing of Illumination Control circuit using Triac
10. Assembly and testing of SCR Controlled Emergency light
11. Study of Integrator and Differentiator circuit using OPAMP 741
12. Study of Adder and comparator circuit using OPAMP 741
13. To visit at least four industries mentioned at module 03 and write the report.

### INSTRUCTIONAL STRATEGY

Electronics in Industry is the subject related to practical implementation and exposure of electronic devices and circuits in today's industries. Thus, it requires both theoretical as well as practical exposure.

### RECOMMENDED BOOKS

1. Industrial Electronics: S.K. Bhattacharya / S Chatterjee, Tata McGraw-Hill Publishing Company Limited
2. Industrial Electronics: James Humphries, Leslie Sheets, 4e - Delmar Publications
3. Industrial Electronics: Biswanath Paul PHI
4. Industrial Electronics for Technicians: J.A.Sam Wilson Joseph Rissi, Prompt Publications
5. Thyristors and its Application by Ramamurthy, East West New Delhi
6. Modern Digital Electronics by R.P. Jain, McGraw Hill Publication
7. Op-amp and linear integrated circuits by Gaikwad, Eastern co. Edition PHI
8. Electrical and Electronic Measurements by A. K. Sawhney, Dhanpat rai & Sons New Delhi
9. Power Electronics by P.C. Sen, Tata McGraw-Hill Publishing, New Delhi
10. Digital Electronics by Malvino Leach, Tata McGraw-Hill Publishing, New Delhi

### SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	30	60
2	18	40
<b>Total</b>	<b>48</b>	<b>100</b>

## 5.5 DIGITAL SWITCHING AND CIRCUITS

L T P  
Periods/Week 4 - 4

### 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 FAX, electronic exchanges etc. so vital for present day communication.

### DETAILED CONTENTS

1. Introduction: (06 Periods)  
Basic block diagram of digital and data communication systems. Their comparison with analog communication systems. Basic information theory.
2. Coding (10 Periods)
  - a) Introduction to various common codes 5 bit Baudot code, 7 bit ASCII, EBCDIC
  - b) Code error detection and correction techniques - Redundancy, parity, block check character (BCC), Vertical Redundancy check (VRC), Cyclic Redundancy check (CRC), Hamming code
3. Digital Modulation Techniques: (14 Periods)
  - 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 Amplitude modulation (QAM)
4. Characteristics/working of data transmission circuits; bandwidth requirements, data transmission speeds, noise, cross talk, echo suppressors, distortion, equalizers (06 Periods)
5. UART, USART: Their need and function in communication systems (06 Periods)
6. Modems: (08 Periods)  
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. Electronic Exchange and FACSIMILE (FAX) (14 Periods)

- 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.
- Introduction to EPABX.
- Basic idea of FAX system and its applications. Basic Principle of operation and block diagram of modern FAX system. Important features of modern FAX machines.

### **LIST OF PRACTICALS**

1. Observe wave forms at input and output of ASK and FSK modulators
2. To transmit parallel data on a serial link using USART
3. Transmission of data using MODEM.
4. Observe wave forms at input and output of a PSK and QAM circuit
5. To study the working principle of a telephone handset
6. To study the working principle of a FAX machine.
7. To study the working principle of an EPABX.

### **NOTE:**

Visits to the sites of all types of telephone exchanges (including mobile and WLL), FAX 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 Digitals 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 system By A.K. Gautam S.K. Kataria Sons, Delhi
3. Electronics communication by K.S. Jamwal, Dhanpat Rai and Sons, Delhi

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic</b>	<b>Time Allotted (Periods)</b>	<b>Marks Allotted (%)</b>
1	06	10
2	10	15
3	14	20
4	06	10
5	06	10
6	08	15
7	14	20
<b>Total</b>	<b>64</b>	<b>100</b>

## 5.6 PROCESS CONTROL AND INSTRUMENTATION

	L	T	P
Periods/ Weeks	4	-	2

### RATIONALE

The technician has the responsibility of using and maintaining electronic test equipments, for measurement, design, testing and trouble shooting, with the introduction of new techniques of process control in modern industries, the use of transducing elements in agriculture and other non-engineering areas, the task of the technician has become varied and different from the previous task of measurement only.

The Course aims to develop appreciation and understanding of the use of measurement of a variety of physical quantities and their control.

### (A) Process Instrumentation

1. Introduction (04 Periods)
  - Functional block diagram of instrumentation system.
  - Description of each block
  - Process
  - Process Characteristics
  - Process Variables
2. Pressure Measurement (05 Periods)
  - Types of Pressure
  - Measurement of Pressure by Manometers
  - Diaphragms
  - Bourdon Tube
  - Bellows
  - Vacuum Measurement
3. Temperature Measurement (05 Periods)
  - Temperature Measuring Devices Like Thermocouples.
  - Pyrometer
  - Resistance Thermometer.
  - Thermister
  - Bimetallic Thermometer
4. Strain Measurement (05 Periods)
  - Requirements for strain measurement
  - Strain Gauges
  - General Strain Measurement
  - Load cell

5. Vibration and Angular Velocity Measurement (05 Periods)
- Vibration Measurement Systems
  - Measurement of Angular Velocity
  - DC & AC Tachometer Generators
  - Digital Methods
6. Flow Measurement (06 Periods)
- General
  - Types of Flow
  - Flow Coefficient
  - Renolds No
  - Flow Meters
  - Venturi Meter
  - Orifice Plate
  - Pitot Tube
  - Rotameter
7. Humidity, Moisture and Level Measurement (04 Periods)
- Hygrometer method for humidity measurement
  - Moisture meter
  - Electrical contact type liquid level indicators
8. Chemical, Analytical, Medical & Nuclear Instruments (07 Periods)
- Spectrophotometer, Filters
  - Electrochemical Sensors
  - PH Meter
  - General idea and working and application of Medical Instruments as X-Ray Machine, Electronic method for BP measurement, Blood Sugar measurement, EEG and ECG machine
  - Brief description of Nuclear Instrumentation

**(B) Process Control**

9. Introduction (02 Periods)
- Block diagram of a general open and closed loop process
  - Automatic Control
10. Control System Components (06 Periods)
- Brief description and working of a potentiometer
  - Differential transformer, servo motors
  - Tacho Generator
  - Eddy Current clutches, relay contractors, timing relay

11. Types of Control Techniques (05 Periods)

- Brief Idea and Introduction of following control techniques
- ON-OFF Control
- Proportional
- Integral
- Derivative
- PI
- PD
- PID

12. Controller (10 Periods)

- Block Diagram & Circuits of pneumatic PI,PD & PID controller, ON-OFF Controller
- Electronic Controller/Automatic Controller
- Simple Example Of
- Heating Control using SCR
- Illumination Control
- Level Control
- Pressure Control

### LIST OF PRACTICALS

1. Experiment of Pressure Measurement
2. Experiment of Temperature Measurement
3. Experiment of Flow Measurement
4. Experiment of Moisture/Humidity Measurement
5. Experiment of Strain Measurement/ load cell
6. Experiment on spectrophotometer and PH meter.
7. Measurement of Level
8. Measurement of angular velocity
9. ON /OFF Controller
10. Experiment of Elex Controller
  - a. Heating Control Using SCR
  - b. level Control
  - c. Illumination Control
  - d. Pressure Control

### RECOMMENDED BOOKS

1. Instrumentation Devices & Systems by By S. Ranjan; Tata McGraw-Hill Publishing
2. Electrical & Elex Measurement by A. K. Sawhney; Danpat Rai & Co.
3. Industrial Instrumentation by Tyson
4. Process Instrumentation by Donald P. Echman
5. Process Control by Donald P. Echman
6. Instrumentation by Cirk & Rimboi
7. Instrumentation Measurement and Analysis by B. C. Nakra and K K Chaudhary; MC Graw Hill Publication



8. Electronics Instrumentation by H.S. Kalsi; McGraw Hill Publication
9. Medical Instruments by S. Ananthi; New Age International (P) Limited Publisher

### SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	04	05
2	05	05
3	05	05
4	05	05
5	05	05
6	06	10
7	04	05
8	07	15
9	02	05
10	06	10
11	05	10
12	10	20
<b>Total</b>	<b>64</b>	<b>100</b>