5.1 AUDIO AND VIDEO SYSTEM

L	T	P
4	-	4

Unit:- I **(22 Periods)**

Audio System

1.1 Basics of Working Principle, Construction, polar pattern, frequency response & application of Carbon, moving coil, velocity, crystal, condenser & cordless microphones.

1.2 Basics of Working Principle, Construction, polar pattern, frequency response & application of direct radiating & horn Loud Speaker. Basic idea of woofer, tweeter, mid range, multi-speaker system, baffles and enclosures. crossover networks, Speakers column.

UNIT: 2 **(20 Periods)**

SOUND RECORDING:-

1- Fundamentals of Sound recording on Disc & magnetic tape. Brief principle of sound recording. Concept of tape transport mechanism

2- Digital sound recording on tape and disc. Brief concept of VCD, DVD and Video Camera.

3- Principle of video recording on CDs and DVDs. Recordable and Rewritable CDs. Idea of pre-amplifier, amplifier and equalizer system, stereo amplifiers.

Unit:3 **(12 Periods)**

ACOUSTIC REVERBERATION:-

1- Reverberation of sound. Absorption and Insulation of sound. Acoustics of auditorium sound in enclosures. Absorption coefficient of various acoustic materials. (No mathematical derivations).

Unit 04 **(10 Periods)**

VIDEO CAMERA:-

1- Main features, Working principle, Area of application, Identification of various stages and main components, of single tube camera, ENG camera.

TEXT BOOKS

1. A. Sharma- *Audio Video & TV Engineering*- Danpat rai & Sons.
2. Benson & Whitaker - *Television and Audio Handbook*- McGrawHill Pub.

LIST OF PRACTICAL'S

1- Study of different features and Measurement of directivity of various types of microphones and loudspeakers. (Approximate).

2- Draw the frequency response, bass and treble response of stereo amplifier.

3- Channel separation in stereo amplifier and measurement of its distortion.
4- Installation and operation of a stereo system amplifier. Fault finding in stereo chain.
5- Frequency response of crossover networks in speaker columns.

6. Familiarity with the working of drive mechanism of a tape recorder. Fault finding and preventive maintenance in tape recorders.

7. Installation and operations of PA system. (Preferably in auditorium).

8. Operation of VCR and familiarity with DC voltage wave shapes at major points and identification of different faults in a faulty VCR and their rectification.

9. Familiarity with the working of audio CD player and identification of main stages and components.

10. To study the operation and control of CD and DVD player and identification of main stages and components.

11. To study the operation and control of Colour Video Camera and identification of main stages and components

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lecturers and Tutorials (Period)	Marks Allotted
1.	22	15
2.	20	15
3.	12	10
4.	10	10
TOTAL	**64**	**50**

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 inter electrode 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 in 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

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

5.3 Digital Data Communication

L	T	P
4	-	4

Rationale

The course provides the student with: Principle of modulation, types of modulation and principles of digital data transmission. Communication methods and equipment used in data transmission. Different types of multiple access technique.

Detailed Contents

UNIT: 1

1- Introduction of Communication System **4 Periods**

- Basic of Analog communication and Digital communication. Difference between analog and digital communication.
- Basic Block Diagram of analog communication System and Digital Communication System. Advantage and disadvantages of digital Data communication.
- Concept of Bandwidth, Noise and Channel Capacity of different communication system.

2- Analog Modulation Technique- **8 Periods**

- Need of modulation in communication systems. Concept of Analog modulation technique- AM, FM, PM, PAM, PWM, PPM. Need Of Carrier suppression. Concept & application of SSB-SC, DSB-SC & VSB.

3- Digital Modulation Technique- **12 Periods**

- Sampling with Sampling Theorem. Concept of Digital Modulation- ASK(Amplitude Shift Keying), FSK(Frequency Shift Keying), PSK (Phase Shift Key) , QPSK(Quadrature Phase Shift Keying)and PCM (Pulse Code Modulation), Quantization , Quantization Error (No Mathematical Treatment) , QAM.

UNIT: 2

4. **Transmission of Digital Data- 8 Periods**
    - Transmission of binary data, concepts of simplex, half duplex and full duplex modes Transmission.
    - Serial and parallel data communication, comparison in terms of speed of data transmission.
    - Synchronous data transfer mode, data transfer efficiency. Asynchronous data transfer mode, relative advantages and disadvantage of with synchronous communication.
5. **Multiplexing and Multiple Access Technique- 12 Periods**
    - Frequency Division Multiplexing/Multiple Access.
    - Time Division Multiplexing/ Multiple Access.
    - Performance Comparison of FDMA and TDMA.
    - Code Division Multiple Access.

6. **Data Communication Hardware- 8 Periods**

- UART, USART, Their need in communication.
- Need and function of Modems. Modem data transmission speed, Modes of Modem operation, Modem interfacing (RS 232 interfacing other interface)

UNIT : 3

7. **Coding 12 Periods**

- Introduction to various common codes 5 bit Baudot code. 7 bit ASCII, ARQ, EBCDIC Code error detection and correction techniques Redundancy, parity, block check character (BCC). Vertical Redundancy check (VRC). Longitudnal Redundancy Check (LRC). Cyclic Redundancy Check (CRC), Hamming code

LIST OF PRACTICAL

1- Prove the sampling theorem. Reconstruct the analog signal from samples.
2- Observe the wave shape of ASK, FSK and PSK, QPSK.
3- Observe Frequency division multiple access.
4- TDM Access at different sampling frequency.
5- Using CDMA Trainer, Study the code division multiple access technique .
6- Observe the wave shape of Pulse code modulation and demodulation. .
7- Practical on RS 232.

RECOMMENDED BOOKS

1- Mobile and wire less Communication by Stalling, Pearson Publishers
2- Electronics Communication system by KS Jamal, Dhanpat Rai & co., New Delhi.
3- Principles of digital communication by J. Das- New Age Publishers, New Delhi.
4- Computer network by Tenenbaun Andrews, Prentice Hall of India, New Delhi.
5- Data Communication and Networking by Foronzan TMH, New Delhi.
6- Fundamentals of Error Correcting Codes by W. Cary Huffman

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allocation%
1	04	05
2	08	10
3	12	20
4	08	10
5	12	20
6	08	10
7	12	20
Total	**64**	**100**

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
1. 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
Total	**48**	**100**

5.5 ANTENNA & WAVE PROPAGATION

L T P
4 - 3

RATIONALE- This subject includes an exposure to different types of antenna. This course also deal with the wave propagation . The Students should understand the advantages and limitations of various Antennas and wave propagation.

UNIT 1 : RADIATION AND WAVE PROPAGATION

1- INTRODUCTION (26 Periods)

- Electromagnetic spectrum and its various ranges: VLF. LF, HF, VHF, UHF, Microwave.
- Basic idea about different modes of radio wave propogation and typical areas of applications
- Effect of the environment
- Ground Wave Proagation
- Space Wave Propagation
- Sky Wave Propagation
- Tropospheric Scatter Propagation.
- Definition of Refractive index. Critical frequency. Skip distance**,** Maximum usable frequency, fading. ,virtual height **of antenna**

UNIT 2: FUNDAMENTAL OF ANTENNA

2- ANTENNA FUNDAMENTALS : (10 Periods)

- **Basic of antenna**: The basic radiation Mechanisem .Wire Radiators in Space.Current and Voltage distributions.Resonant and non resonant antennas.Isotropic Antenna.
- **Terms and Definitions** :directive gain,directivity & Power gain,radiation resistance,Antenna Efficiency, Aperture Area, Beamwidth , band width and polarization.
- **Effect of Ground on Antennas:** Ungrounded Antenna, Grounded Antenna.
- **Effects of antennas Heights.**

3- FUNDAMENTAL OF HALF WAVE DIPOLE OR DIPOLE ANTENNA. (10 Periods)

- Resonant Antenna Half wave dipole antenna & its Radiation pattern.
- Folded dipole antenna & its radiation pattern.
- Radiation pattern for Dipole Antenna of different length
- Brief description of broadside and end fire arrays, their radiation pattern and applications (without analysis)
- **Non-resonant antennas**- The Rhombic antenna.

UNIT 3: TYPES OF ANTENNA

4- WIDE BAND ANTENNA, ITS CONSTRUCTION AND WORKING- (10 Periods)

- Yagi antenna
- Helical antenna
- Discone antenna
- Log periodic antenna
- Loop Antenna
- Phased Arrays .

5- MICROWAVE ANTENNAS: (08 Periods)

- Parabolic antenna
- case grain antenna
- horn antenna

LIST OF PRACTICAL

1- **Study of Omni directional antenna. Find out the Radiation Pattern**
2- **To Study the Phenomenon of Linear Polarization of Antenna.**
3- **Study of Antenna Resonance, VSWR & Impedance.**
4- **Study of Dipole & Folded Dipole Antenna.**
5- **Study of Yagi antenna with reflector and director antenna.**
6- **Study of any 3 antenna (Broadside Array, End fire Array, Loop antenna, Log Periodic, Helical Antenna, Rohmbic Antenna, Horn Antenna, Dish Antenna)**

TEXT BOOKS

1- George Kennedy "Electronics communication system"

2. E.C.Jordan and Balmain, "Electro Magnetic Waves and Radiating Systems", PHI, 1968, Reprint 2003.
3. K. D. PRASAD " Antenna and wave propagation " Satyaprakash Publications.

REFERENCES

1. John D.Kraus and Ronalatory Marhefka, "Antennas", Tata McGraw-Hill Book Company, 2002.
2. R.E.Collins, 'Antennas and Radio Propagation ", McGraw-Hill, 1987.
3. Ballany , "Antenna Theory " , John Wiley & Sons, second edition , 2003.

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (Periods)	Marks Allocation%
1	26	45
2	10	15
3	10	15
4	10	15
5	08	10
Total	**64**	**100**

5.6 Television Engineering

L	T	P
4	-	3

1- Basic of TV- **(16 Periods)**

- Elements of TV communication system.
- Scanning- Need of scanning ,Idea of Aspect Ratio, resolution .& tonal gradation.
- Need for Synchronizing and Blanking Pulses.
- Progressive scanning- Gross structure filters, interlaced scanning, resolution and band width requirement.
- Composite video signal (CVS) at the end of even and odd fields.
- Equalizing pulses and their need.
- Concept of Camera- Plumbicon, Videocon , CCD Camera.

2- MonochromeTV **(10 Periods)**

- Picture tube-construction and working, comparison of magnetic and electric deflection of beam.
- Block Diagram of TV receiver: Function of each block.

3- Colour TV **(24 Periods)**

- Primary Colours, tristimulus values, trichromatic coefficients, concept of additive and subtracting mixing of colours, concepts of luminance, Hue and Saturation, representation of a colour in colour triangle, non spectral colour, visibility curve.
- Compatibility of colour TV system with monochrome system. Basic colour TV system –NTSC, SECAM, PAL.
- Need for luminance signal and band sharing by colour signals, sub-carriers frequency, colour difference signal and its need, synchronous quadratic modulation and representation of a colour by a vector, burst signal and its need, chrominance signal.
- Block diagram and working color tv transmitter
- Block diagram and working color tv receiver

4- Recent trends in TV **(14 Periods)**

- Block diagram and Working of LED ,LCD display and Large screen display
- Block Diagram and working of HDTV , 3D-TV, Cable TV, DTH .

LIST OF PRACTICAL

1- Familiarization with the different sections of B/W TV Receiver.
2- To observe the wave forms and voltage at different points of colour TV Receiver.
3- Fault finding and trouble shooting of colour T.V Receiver.
4- Familiarization with different section of LCD & LED TV
5- Study of cable TV network system.
6- Installation of DTH.

RECOMMENDED BOOKS

1. Colour Television-Principles & Practice by R.R Gulati , Wiley Eastern Limited, New Delhi
2. Complete Satellite & cable Television R.R Gulati New age International Publisher, New Delhi
3. Colour Television Servicing by RC Vijay BPB Publication, New Delhi
4. Colour Television & Video Technology by A.K. Maini CSB Publishers
5. Colour TV by A. Dhake
6. Service Manuals, BPB Publication, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allocation%
1	16	24
2	10	20
3	24	36
4	14	20
Total	**64**	**100**