

GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRONICS AND COMMUNICATION (11)

AUDIO VIDEO SYSTEMS

SUBJECT CODE: 2151101

B.E. 5th SEMESTER

Type of course: Undergraduate

Prerequisite: Basic Electronics, Digital electronics

Rationale: The state of the art in Audio and Video system will enable the students to comprehend concept, working principle and its application in various types of modern electronic system. The knowledge acquired by students will help them to become familiar with designing concepts and troubleshooting of audio and video systems.

The low cost video systems, cameras have brought video revolution in the field of home entertainment, education, training, advertising and electronic newsgathering. Dramatic developments in flat panel display, reduction in the cost of image scanning system, LCD display and integrated subsystems has affected our communication capabilities and life-style in broad sense. It is taken care to include these latest developments in the present syllabus.

Teaching and Examination Scheme:

| Teaching Scheme | | | Credits C | Examination Marks | | | | | | Total Marks |
|-----------------|-----|-----|--------------|-------------------|----|---------|-----------------|-----------|----|----------------|
| L | T | P | | Theory Marks | | | Practical Marks | | | |
| | | | ESE (E) | PA (M) | | ESE (V) | | PA (I) | | |
| PA | ALA | ESE | | OEP | | | | | | |
| 3 | 0 | 2 | 5 | 70 | 20 | 10 | 20 | 10 | 20 | 150 |

Content:

| Sr. No. | Content | Total Hrs | % Weightage |
|---------|--|--------------|-------------|
| 1 | Characteristics of Sound: Nature of Sound, Pressure and Intensity of sound waves, Sensitivity of human ear for sound, Frequency of sound waves, Overtones and timbre, Intervals octaves and harmonics, Pitch, Resonance effect in sound systems, Helmholtz resonator, Reflection and diffraction of sound waves. | 2 | 5 |
| 2 | Audio devices and their applications: Microphones: Introduction, Characteristics of a Microphone, Requisites of a Good Microphone, Moving Coil Microphone, Ribbon Microphone, Crystal Microphone, Capacitor(or Condensor) Microphone, Electret Microphone, Carbon Microphone, Comparisons of Various Types of Microphones, Special Microphones, Precautions while Using Microphones Loudspeakers: Characteristics of Loudspeakers, Moving-Coil Cone Type Loudspeaker, Electrodynamic Loudspeaker, Horn-type or Indirect Radiating Type Loudspeaker, Comparison between Cone-type and Horn-type speakers, | 7 | 15 |

| | | | |
|-----------|--|----------|-----------|
| | <p>Loudspeaker column or line source speakers, Baffles and Enclosures, Multi-way Speaker System(Woofers and Tweeters), Crossover networks, Consequence of Mismatch between Amplifier Output and Loudspeaker Impedance</p> <p>Optical recording: Types of Optical Recording of sound, Methods of Optical Recording of Sound on Film, Reproduction of Sound from Films, Modern method of recording of sound for movie films, Compact Disc, Optical recording on Disc, Playback process, Comparison of Compact Discs and Conventional(Gramophone) Discs.</p> <p>Introduction to Blue ray technology, Introduction to High Fidelity(Hi-fi) systems, Introduction to Public Address Systems(PA-Systems), Introduction to Audio Amplifiers, Introduction to Acoustic Reverberation, Introduction to AM/FM tuners, Introduction to USB Mp3 players.</p> | | |
| 3 | <p>Digital Audio Fundamentals: Audio as Data, What is an Audio Signal, Why Binary, Why Digital, Some Digital Audio Processes Outlined, Time Compression and Expansion, Error Correction and Concealment, Channel Coding, Audio Compression, Disk-Based Recording, Rotary Head Digital Recorders, Digital Audio Broadcasting, Networks.</p> | 2 | 5 |
| 4 | <p>Television Fundamentals: Elements of TV communication system, Scanning, Synchronization, Aspect ratio, Pixels, Resolution, Bandwidth, Composite video signal, Modulation of video and audio signals, Monochrome and color cameras, Compatibility, Luminance and Chrominance signal, Picture tubes, Solid state picture transducers, TV broadcasting systems, Video monitors.</p> | 6 | 15 |
| 5 | <p>Digital video, compression techniques and standards: Digital Video, The RGB and YUV Representation of Video Signals, The Need for Compression, How compression works, Compression formats for video - MPEG-x format, H.26x format</p> | 3 | 5 |
| 6 | <p>Digital Television-Transmission and Reception: Digital system hardware, Signal quantizing and encoding, digital satellite television, Direct-To-Home(DTH) satellite television, Digital TV receiver, Merits of digital TV receivers, Digital Terrestrial Television(DTT), Introduction to Video on demand, Introduction to CCTV, Introduction to CATV</p> | 4 | 10 |
| 7. | <p>Stereophonic sound, Flat panel TV receivers, 3-Dimensional TV, EDTV, HDTV and Digital Studio equipments: Stereo sound systems, Projection television, Flat panel display TV receivers, Three Dimensional (3-D) television, Advances in 3D TV technology, Present status of new 3D receivers, Extended Definition Television(EDTV), Digital equipment for television studios, Electronic control of studio lights, Digital audio recorders and editing, Colour receivers of new generation</p> | 6 | 15 |
| 8. | <p>Liquid Crystal and Plasma Screen Televisions: LCD technology, LCD matrix types and operation, LCD screens for television, Plasma and conduction of charge, Plasma television screens, Signal processing in Plasma TV receivers, A Plasma colour receiver, LCD colour receivers, Single LCD receivers, 3-LCD colour receivers, Plasma or LCD-which is the best choice, Performance comparison of Plasma and LCD televisions, Introduction to LED TV, RGB dynamic LEDs, Edge-LEDs, Differences between LED-backlit and Backlit LCD displays, Comparison of Plasma TV and LED TV, Introduction to OLED</p> | 6 | 20 |

| | | | |
|------------|--|----------|----------|
| | TVs | | |
| 9. | Projection Display Systems and Television Home Theaters: Direct View and rear projection systems, front projection TV system, Transmittive type projection systems, Reflective projection systems, Digital Light Processing(DLP) projection system, Projection television for home theatres, Choice of projection TV system, Essential features of front projectors, Comparison and choice of rear projection receivers, Satellite Off-Air tuners and Digital Video Recorders, Surround sound stereo receiver, Top of the line Home Theatre | 5 | 5 |
| 10. | Troubleshooting in Audio and Video Equipment: Introduction, Modern Electronic Equipment, Maintenance Policy, Maintenance Aids for Fault Diagnosis, Procedure of Servicing and Maintenance, Shielding and Grounding, Fault location, Identifying the faulty component in the Faulty stage, Some common Faults in Components, Intermittent Faults, Troubleshooting in a power supply unit, Troubleshooting in a Public Address system, Troubleshooting in Stereo Amplifier, Troubleshooting in DVD Players. | 4 | 5 |

Suggested Specification table with Marks (Theory):

| Distribution of Theory Marks | | | | | |
|------------------------------|-----------|-----------|-----------|-----------|-----------|
| R Level | U Level | A Level | N Level | E Level | C Level |
| 15 | 15 | 10 | 10 | 10 | 10 |

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Modern Television Practice(Fourth revised edition) - R.R.Gulati , New Age International Publishers.
2. Audio and Video Systems(Second Edition) - R.G.Gupta, McGraw Hill Education Limited.
3. Television & Video Engineering(Second edition) - A.M.Dhake, McGraw Hill Education Limited.
4. Video Demystified – Keith Jack, LLH Technology Publishing.
5. Audio Engineering, Know it all series, Newnes Press
6. Essential Guide to Digital Video - John Watkinson, Snell & Wilcox Inc. Publication.
7. Guide To Compression - John Watkinson, Snell & Wilcox Inc Publication
8. Audio Video Systems Principles Practices and Troubleshooting - Bali & Bali, Khanna Publishing Company.
9. Consumer Electronics - S.P.Bali, Pearson Education.

Course Outcome:

After learning the course the students should be able to:

1. Describe the basic idea and fault finding in audio and video transmitter, and receiver sections.
2. Explain importance of Digital Audio and Video systems including importance of compression.
3. Distinguish between Stereo & Hi-fi Amplifier.

4. Understand CD/DVD player mechanism and fault finding in CD player.
5. Explain AM/FM tuners, MP3 players and Blue-Ray Technology.
6. Explore advanced Digital color Television systems (LCD, LED, Plasma) and fault finding.
7. Exposure of the HDTV, 3D TV and OLED TV

List of Experiments:

1. To study public address system and its components.
2. To obtain the Directional Response of Loudspeaker.
3. To obtain the Directional response of micro phone.
4. To obtain the frequency response of loudspeaker.
5. To obtain the frequency response of Microphone.
6. Draw and study drive mechanism layout of CD player.
7. Fault finding in CD player (Three different faults).
8. To perform digitization of sound signal and edit it using Computer Software.
9. To test color TV using pattern generator.
10. To obtain frequency response of IF amplifier using VHF sweep generator.
11. To perform fault identification in Colour TV.
12. To perform analysis of Composite Video Signal.
13. To study installation of DTH System.
14. To design and obtain frequency response of Cross- over network.

Design based Problems (DP)/Open Ended Problem:

1. Simulation of Video Compression technique/s.
2. Study of CD/DVD/MP3/AM/FM Player.
3. Study of Digital TV.
4. Study of High Definition TV.
5. Study of LCD TV.
6. Study of LED TV.
7. Study of 3D TV.
8. Study of OLED TV.
9. Study of Cable TV System.
10. Estimate the cost, labor of cable TV installation.
11. Collect information about Set Top box used for Cable TV at home.

Visit to a Cable TV Operator/TV/Radio stations and prepare comprehensive report of your observations..

List of Open Source Software/learning website:

1. <http://www.electronicandyou.com/>
2. <http://electronics.howstuffworks.com/>
3. <http://electronicdesign.com/>
4. <http://electronicsforu.com/>
5. <http://www.101science.com/Radio.htm#Television>
6. <http://tv.manualsonline.com/>

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the

group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.