

## ABOUT THE COURSE

The growth of knowledge-based societies presents great opportunities and challenges for the social and economic health of all countries. Science and Technologies contribute remarkably for this exponential growth. Among these, Electronics is a very vast field, embracing almost all walks of human endeavours. Rapid advancements in Electronics and Communication Technology have already had a profound impact on life in the 21st century.

The development in semiconductor technology made it possible to integrate a large number of devices in a small silicon chip, known as integrated circuit. Today the computers, made using these powerful chips, have tremendous capabilities, which can be used for almost all applications- business, scientific, engineering, defence, etc. The major areas of applications of electronics and communication are instrumentations, general communications, medical electronics, computers, wireless communications, automobiles, entertainments, etc.

With the advent of Internet and E-commerce, new ways of doing business have emerged. In the next few years, it will be possible to build a virtual company, using the most appropriate people. Further technological advancements in these areas have been predicted, to make those kinds of gadgets essential in the high-tech future.

Twentieth century science fiction is turning into twenty first century fact. The future looks exciting, as the change is accelerating at rapid pace. Thus the relevance of electronics and communication technology opens a large number of opportunities in the related fields.

The electronics and communication technology course aims to develop in students the skills, attitudes and knowledge to cater to the emerging needs of Technicians in this field. It also provides opportunities to the aspirants for higher studies in diploma and/or professional/vocational degree.

## JOB ROLES

<b>GOVT/ SEMI GOVT SECTOR</b>	<b>PRIVATE SECTOR</b>	<b>SELF EMPLOYMENT</b>
<ul style="list-style-type: none"> <li>• <i>Wireless Operator, BSNL, Defence, Forest Dept. Police, Paramilitary</i></li> <li>• <i>Tradesman, tech. Education Dept.</i></li> <li>• <i>Signal Operator- Telecommunication in Defence</i></li> <li>• <i>Electronics technician in different Service sectors</i></li> <li>• <i>Lab Technical Asst. In VHSE</i></li> <li>• <i>Technician in Doordarsan and AIR</i></li> <li>• <i>Electrical Meter Tester</i></li> <li>• <i>Studio Technician</i></li> <li>• <i>Broadcast Technician</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Electronics technician in different Service sectors</i></li> <li>• <i>Manual Soldering Technician</i></li> <li>• <i>PCB &amp; Assembly Operator</i></li> <li>• <i>Cable TV Operator</i></li> <li>• <i>DTH installer and service Technician</i></li> <li>• <i>CCTV operator and Servicing technician</i></li> <li>• <i>Repair Asst.</i></li> <li>• <i>Smart Phone Technician</i></li> <li>• <i>Computer Hardware</i></li> <li>• <i>Sales Executive IT Hardware</i></li> <li>• <i>IT and Networking Technician</i></li> <li>• <i>Mechatronics Technician</i></li> <li>• <i>Sales Technician</i></li> <li>• <i>Technician In-car Computer</i></li> <li>• <i>Biomedical Equipment Operator</i></li> <li>• <i>Micro-controller Technician</i></li> <li>• <i>Studio Technician</i></li> <li>• <i>Broadcast Technician</i></li> <li>• <i>Live Sound Technician</i></li> <li>• <i>LED lamp Technician</i></li> <li>• <i>Solar lamp Technician</i></li> <li>• <i>Solar inverter Technician</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Manual Soldering Technician</i></li> <li>• <i>PCB &amp; Assembly Operator</i></li> <li>• <i>Cable TV Operator</i></li> <li>• <i>DTH installer and service Tech</i></li> <li>• <i>CCTV operator and Servicing technician</i></li> <li>• <i>Smart Phone Technician</i></li> <li>• <i>Computer Hardware Technician</i></li> <li>• <i>IT and Networking Technician</i></li> <li>• <i>Mechatronics Technician</i></li> <li>• <i>Digital Media entrepreneur</i></li> <li>• <i>Studio Technician</i></li> <li>• <i>Live Sound Technician</i></li> <li>• <i>LED Lamp-Entrepreneur</i></li> <li>• <i>Solar Lamp-Entrepreneur</i></li> <li>• <i>Solar inverter-Entrepreneur</i></li> </ul>

## SUBJECT APPROACH

Vocational Higher Secondary Course in ECT is designed to achieve the skills required for various blue collar jobs falling under four distinct areas of Electronics industry. In an industrial scenario such as Electronics and communication, where technology changes faster than flash of light, it is not as that easy to equip an incumbent with the latest technical know-how. But if he is well trained to acquire the basics and prepared to update and apply the knowledge to newer situations, it will be easier for him to get adopted to the new atmosphere. To be very simple, this is the attitude and approach accepted and followed throughout the treatment of the subject.

The course is expected to cover the skills related to four most relevant fields of modern electronics namely Basic Electronics and Sound Engineering, digital Electronics Computer hardware and networking, Microcontroller and Robotics and Wireless and fibre optic communication and Mobile Technology. Needless to say these are the areas which bring about rapid changes both in our daily life and within their own technology itself. Being aware of the complexities of the / topics, maximum care is observed to restrict the depth of treatment not to go above the limit that can be conceived by a learner at higher secondary level. Unwanted derivations ambiguity theoretical explorations and surplus of irrelevant data are strictly avoided. At the same time theoretical back up and support is always provided when and where demanded. The treatment of the subject is totally based on various activities intended to create the interest in learners and ensure their active involvement "Learning through Doing" motto is tried to be followed to the extent possible. Most of the activities are so planned as to carry out in groups since that will help to develop interactive learning and peer sharing.

The scope and nature of the subject does not allow to limit the activities within the four walls of a class room. Some of the activities are definitely targeted to let loose the imagination of the learners and acquaint them with the real atmosphere they are to experience during and after the course. While most of the activities can be performed within the class room and laboratory with the supportive infrastructure, a few of them are to be arranged in a neighbouring work site or establishment through field visit or on the job training.

Another important factor considered while approaching the subject was the scope for vertical mobility. As stated earlier the treatment of the subject is purposefully restricted to basic level. At least a few of the learners may not be contented with this and tries to climb further. For such aspirants to fulfil their dreams there is enormous scope possibilities. A part from the conventional graduate and diploma level courses many of the reputed institutions and universities such as IGNOU are conducting specialised diploma and degree courses in all the four modules included here. These courses offer better placement and professional growth than any other orthodox stream.

Last but not least, the social and ethical values tried to be incorporated must be mentioned. The course is so designed as to come within the frames in side education, providing equal chance and scope for differently able children. Majority of the suggested activity can be so planned as to include these children also. Also most of them do not warrant a much hard work or physical strain. Most of the targeted job rolls are also can intake persons with differential abilities without any

sacrifices on result. The more important social commitment and other responsibilities are never forgotten in our approach to the subject. Activities are so planned to encourage interaction among learners, improve team work, trust and care each other and fight with single mind to attain an outcome.

The purpose of any stream of education is not simply to dump piles of knowledge to one's mind, but to develop necessary skills and awareness within him to enable him lead a successful life. To lead a successful social and personal life it is essential to cultivate the various soft skills or life skills such as sharing, caring, helping etc. within him. The activities presented here are not merely targeted to attain the outcome only but carefully planned to develop these soft skills. In short the course put forward a single motto for our dear learners" The carrier is not simply a mode of making money but a holy and jolly way of living a fruitful life".

## SYLLABUS

### Module 1 Basic Electronics and Sound Engineering

#### Unit 1 Introduction to sound Engineering 30 hours

Sound effect, fundamental units of Audio signal - Intensity, frequency, Pitch. Frequency range of audio signal.

Units of measurement of sound intensity, Decibel , Adverse effects of sound pollution & prevention.

Application of sound - Live - Broadcasting. Microphones and its use, symbol , Moving coil microphone - working , Various types of microphones and its connections (Introduction only). Loud speakers and its use, symbol of loud speaker, Moving coil loud speaker-working. Different types of loud speakers and their identification.(introduction only) Specifications and characteristics of microphones and loud speakers-comparison

#### Unit 2 Hobby circuits 180 hours

Identification of components and their symbols in the given circuit.- Resistor, Capacitor, Inductor, Diode, Transistor, LDR, IC, LED. Testing of Diode, Transistor- using multimeter. Colour coding of resistors. Various techniques in soldering, solder and de solder on PCB. Define the terms- Current, Voltage, Resistance and statement of Ohm's Law. Measurement of current, voltage, and resistance-using multimeter Concept of AC and DC, conversion of AC into DC . Block diagram and explanation of Regulated DC Power Supply. Transistor and its applications. Sensors and Modules. MOSFET and IGBT

**Unit : 3 Audio Amplifier** 60 hours

Audio Amplifier and its application . Amplifier using Transistor / IC TBA 810 . Gain of Amplifier, Noise . Measurement of Amplitude and Frequency with the help of CRO and Function Generator. Introduction of different types of audio cables and connectors and their applications Classification of cables and connectors

**Unit : 4 Audio Effects** 40 hours

Mono and Stereo effects of sound . Setting up of simple Mixer and Equalizer . Different blocks of PA system Installation and testing of Public Address System - -with out noise pollution , Different standards of sound- Noise reduction techniques-Dolby system

**Unit : 5 Audio Processing and Recording** 30 hours

Studio Mixer and its operation . Understand Routing and Panning, Phase reversal and Flip .Block diagram of Digital audio work station. Concept of Equalisation , Band width and Gain. Comparison of Graphic, Complementary and Automated Equalizers . Introduce frequency Analyser and Harmonic Generator.

**Project : construct a LED lamp or a Solar based lamp**

Doppler effect, Nyquist theorem, Sampling theorem. Construction of simple Equalizing circuits ( LPF and HPF). Construction of Audio Bass / Treble board. Live Digital Recording. - Observing. Brief description of Audio Studio schematic . Audio recording room familiarisation . Audio control room familiarisation . Introduce Audio console.

**Module 2 : Digital Electronics, Hardware and Networking****Unit :1 Digital Electronics** 50 hours

Digital and Analog systems-comparison , Binary number system-decimal to binary, binary to decimal, Elements of Digital logic -Logic gates (OR, AND, NOR, NAND, NOT)- Truth table, Encoding, Decoding, Multiplexing, De-multiplexing, Counter, Flip Flop, register. Digital Computers- Study of different parts of a computer system, Block diagram Explanation. SMPS Working with BD,UPS - Working and familiarisation.

**Unit : 2 Input/ Output devices** 30 hours

Familiarisation of Basic input devices. Keyboard, Mouse, Audio port, Scanner, Webcam

And other I/P devices and their use. Familiarization of Basic O/P devices. Monitor, Modems Printer, Headset, audio cards -Latest input and output devices- listing

**Unit : 3 Mother board and CPU** 40 hours

Familiarisation of parts of a mother board . Interfacing of Mother Board. different pins, ports, sockets in Mother board Different types of processors -speed , cores and RA. Identify different slots, Fixing and removing RAM on the mother board. Different types of processors - speed , cores and RA. Identify different slots, Fixing and removing RAM on the mother board.

**Unit : 4 Memory Device** 50 hours

Role of memory in a computer system , RAM, ROM, PROM,EPRM, comparison ROM and RAM - Comparative study of RAM, DRAM, SRAM, SDRAM, DDRAM. Types of expansion cards CD, DVD, USB, Drives- pen drive, external hard drive, graphics card. Assemble a computer, Safety and security , Trouble shooting of PC. Familiarisation of Lap Top, Note Book.

**Unit: 5 Operating System** 30 hours

Operating system , Windows , Linux ,Free Software, UBUNDU Installation Procedure-Different steps in Installation, Mac os . Partitioning of HDD, Trouble shoot a PC. Install different I/P, O/p devices, Identify and use of proper cables .e-waste, ill effects of e-waste , how to minimise e-waste ,dispose e-waste safely

**Unit: 6 Computer Networking** 140 hours

Introduction to networking .Need for networking ,Understand different network topologies.-Bus, star, Ring, Tree etc. Introduction to router and switcher, Introduction to LAN ,Compare LAN, MAN, WAN, - Bridge, Gate way, Hun switch, world wide web. Wireless LAN, Wireless node, Wifi , Bluetooth, Bluetooth standards

**LEARNING OUTCOMES**

After the completion of two modules, the learner will be able to;

**Module -1: Basic Electronics and Sound Engineering:****Unit : 1 Introduction to sound Engineering**

- 1.1.1 Identify sound effect, unit of sound signal, unit of Sound intensity, decibel dB, measure the frequency.
- 1.1.2 Understand audio Electronics and fundamentals of sound
- 1.1.3 Identify the applications of sound
- 1.1.4 Explain the working of moving coil microphone
- 1.1.5 Able to identify various types of microphones and its specifications and characteristics.
- 1.1.6 Handle microphone safely considering safety measures

- 1.1.7 Explain the working of moving coil loud speaker
- 1.1.8 Identify various types of Loud Speakers , their specifications
- 1.1.9 Handle Loud Speaker safely considering safety measure
- 1.1.10 Explain the adverse effects of sound pollution & prevention

### **Unit : 2 Hobby circuits**

- 1.2.1 Identify the components and symbols of Resistor, Capacitor, Inductor, Diode,
- 1.2.2 Identify and draw the symbol of Transistor, LDR, IC, LED.
- 1.2.3 Test diode and Transistor using Multi-meter
- 1.2.4 Handle Multi-meter.
- 1.2.5 Solder and de-solder circuits.
- 1.2.6 Trace the given hobby circuit.
- 1.2.7 Assemble the given hobby circuit.
- 1.2.8 Define and differentiate the terms current, voltage and resistance.
- 1.2.9 Measure current, voltage and resistance using multi-meter.
- 1.2.10 Verify Ohm's Law.
- 1.2.11 Differentiate between AC and DC and their comparison.
- 1.2.12 Identify and distinguish different sections of a Regulated DC Power Supply like rectifier, filter, regulator.
- 1.2.13 Identify PNP and NPN transistor with the help of multi-meter .
- 1.2.14 Identify Emitter , Base, Collector of a transistor.
- 1.2.15 Identify different Sensors and Modules.
- 1.2.16 Identify MOSFET and IGBT and their applications.
- 1.2.17 Explain different types of MOSFET.

### **Unit : 3 Audio Amplifier**

- 1.3.1 Explain amplification, gain and noise.
- 1.3.2 Set up an audio amplifier and verify the performance considering the concept of noise pollution.
- 1.3.3 Identify and handle cables and connectors.
- 1.3.4 Handle and operate signal generator and CRO.
- 1.3.5 Identify cables and connectors.
- 1.3.6 Classify the cables and connectors.

### **Unit : 4 Audio Effects**

- 1.4.1 Identify and recognize Mono and Stereo effects of sound and



the different standards

- 1.4.2 Explain mixer and equalizer
- 1.4.3 Make proper setting of Mixer and Equalizer.
- 1.4.4 Install and test a PA system. (without producing noise pollution)
- 1.4.5 Able to explain Dolby system

### **Unit : 5 Audio Processing and Recording**

- 1.5.1 Explain the block diagram of Mixer unit.
- 1.5.2 Route the channels which needs special effects.
- 1.5.3 Distinguish two types of Mixing boards. Able to Plan the channels .
- 1.5.4 Identify the parts of Digital Audio work station.
- 1.5.5 Identify the software used.
- 1.5.6 Identify equalisation controls.
- 1.5.7 Differentiate between Graphic, Complementary, Automated Equalizers and able to identify the software used.
- 1.5.8 Identify Frequency Analyzer and Harmonic Generator.
- 1.5.9 Construct simple Equalization circuits (LPF and HPF)
- 1.5.10 Make proper arrangements for a Live Recording set up
- 1.5.11 Demonstrate the set up of an Audio Studio using block diagram.
- 1.5.12 Identify the set up of Audio recording room and audio control room.
- 1.5.13 List out the basics of Audio Console.
- 1.5.14 Explain Doppler effect,
- 1.5.15 Construct a LED lamp or a solar based lamp

### **Module -2 Digital Electronics, Hardware and Networking**

#### **Unit:1 Digital Electronics**

- 2.1.1 Explain Digital and analog system. digital to analog and analog to digital converters.
- 2.1.2 Nyquist theorem and sampling theorem
- 2.1.3 The reason for the shift to digital technology
- 2.1.4 Identify binary number system.
- 2.1.5 Convert decimal; no into binary and vice versa
- 2.1.6 Identify basic gates-OR ,AND, NOT,NAND,NOR
- 2.1.7 Verify the Truth tables of basic gates



- 2.1.8 Explain Encoder
- 2.1.9 Explain Decoder
- 2.1.10 Explain multiplexer
- 2.1.11 Explain demultiplexer
- 2.1.12 Explain counter
- 2.1.13 Explain Flip Flop
- 2.1.14 Explain register
- 2.1.15 Identify the different parts of a computer and its functions.
- 2.1.16 Explain about the functions of each block of SMPS and identify SMPS parts.
- 2.1.17 Explain the B.D of SMPS
- 2.1.18 Measure the O/P of SMPS
- 2.1.19 Identify UPS parts.
- 2.1.20 Explain about UPS working (ON line and OFF line)

### **Unit: 2 Input Output devices**

- 2.2.1 Identify keyboard and its connections.
- 2.2.2 Identify types of keyboard.
- 2.2.3 Identify and safely connect mouse.
- 2.2.4 Identify the types of mouse.
- 2.2.5 Identify audio port and its connection.
- 2.2.6 Identify the scanner and its connections.
- 2.2.7 Install and setup a scanner
- 2.2.8 Identify types of monitor and its connections.
- 2.2.9 Identify internal external modems and its connections.
- 2.2.10 Identify O/P ports
- 2.2.11 Setup a printer
- 2.2.12 Connect speakers headsets etc
- 2.2.13 List the latest I/O devices

### **Unit: 3 Mother board and CPU**

- 2.3.1 Explain the types of mother board.
- 2.3.2 Identify different pins, ports, sockets in Mother board.
- 2.3.3 Assemble and dismantle cooling fan and CPU in mother board.
- 2.3.4 Identify different memory modules.

2.4.5 Explain different Processors, speed, cores and RA

#### **Unit: 4 Memory Device**

2.4.1 Explain the role of memory in a computer

2.4.2 Explain RAM,ROM, PROM, EPROM

2.4.3 Compare RAM and ROM

2.4.4 Identify the storage devices.

2.4.6 Explain the advantages of each storage device and its max, capacity.

2.4.7 Identify various slots in motherboard

2.4.8 Fixing and removing of RAMs in motherboard

2.4.9 Take care of the safety persecutions.

2.4.10 Explain mod identify Lap top, Note book etc

2.4.11 Assemble a computer

2.4.12 Trouble shoot a computer

#### **Unit: 5 Operating System**

2.5.1 Explain about OS.

2.5.2 Install OS in a system , (windows, Linux , Ubuntu ).

2.5.3 Do formatting and partitioning of HDD.

2.5.4 Explain different steps in installation procedure.

2.5.5 Trouble short a PC.

2.5.6 Install other Software.

2.5.7 Install different I/P, O/P devices.

2.5.8 Use proper cables

2.5.9 Explain e-waste

2.5.10 Explain the ill effects of e-waste

2.5.11 Explain how to minimize e-waste

2.5.12 Can dispose e-waste safely

#### **Unit : 6 Computer Networking**

2.6.1 Explain about computer networking.

2.6.2 Identify the components in a computer network.

2.6.3 Identify the cables and connectors used in a computer network.

2.6.4 Identify and use router and switcher.

2.6.5 Explain about LAN.

2.6.6 Compare LAN, MAN and WAN.

- 2.6.7 Use crimping tool to assemble cables
- 2.6.8 Usage and selection of connectors
- 2.6.9 Identify the components used for setting up a LAN.
- 2.6.10 Set up a simple LAN
- 2.6.11 Identify and differentiate cables and connectors. Used for networking.
- 2.6.12 Identify the components of a network.
- 2.6.13 Explain the use of each component
- 2.6.14 Use the proper component
- 2.6.15 Setup a Network with server and nodes.
- 2.6.16 Explain wireless LAN, wireless node, Wifi, blue tooth and its standards
- 2.6.17 Explain UDP and TCP(Single way, two way)

### COURSE STRUCTURE

This course consists of 4 modules such as:

Sl.No	Name of Module
1.	Basic Electronics and Sound Engineering
2.	Digital Electronics, Hardware and Networking
3.	Micro-controllers and Robotics
4.	Wireless and Fibre-optic Communication and Mobile Technology

### CLASS ROOM ACTIVITIES

- General discussion
- Assignment
- Chart Preparation
- Circuit Diagram drawing
- Video show
- Animated CD
- Power point presentation
- Demonstration
- Exhibition
- Panel discussion
- simulative experiments
- project

## PRACTICAL ACTIVITIES

- Collection
- Case study
- Simulative experiments
- Animated CD
- Field visit
- OJT
- Interaction with experts in service field
- Interaction with experts in production field
- Interaction with successful entrepreneur
- Video show
- Demonstration
- Lab work
- Virtual labs

## ON THE JOB TRAINING

On the job training is a very effective method to create the awareness intentionally at actual work site situation among the learners. This also will give them more exposure to the latest technologies and modern trends. The awareness of demands in the job atmosphere as compared to a leaning environment. Besides which will help the learner to identify the problem faced while doing the work at job atmosphere as compared to the practical in laboratory. Before OJT the student should be given awareness about the training centre and area of training.

This on the job training is intended to develop working skill, Technological trends, situation handling and product/service oriented problem solving. Also this training will enable the learner to develop all aspects of soft skills, customer relations, environmental rules and regulations, regularity, punctuality, timing and co-worker relation.

In the first and second modules sound engineering, computer hardware and networking are incorporated. First module OJT will concentrate on sound processing , modelling and related environment. We have to familiarise sound in put, sound out put, studio , audio console, latest sound processing equipments and tools along with live sound recording. In the second module OJT will concentrate on hardware assembling and latest networking technologies. We will focus on PC trouble shooting and networking procedure equipments, both indoor and outdoor environments.

## Time frame of OJT

**2 weeks / year**

Steps to be followed

- Identify the areas of the subject in which training is required
- Identify the centres for OJT
- Initiate necessary communication to get the sanction for OJT
- Visit the centre and get details about the nature and method of training offered
- Sign a memorandum - of- understanding with the centre
- Prepare a time schedule for conducting OJT
- Prepare an estimate for the program
- Conduct the program
- Maintain the work diary and other relevant records
- Prepare a consolidated report

## CERTIFICATION OF SKILLS IN EACH MODULE

- 1 Certificate in Basic Electronics and Sound Engineering
- 2 Certificate in Digital Electronics , Hardware and Networking
- 3 Certificate in Micro-controllers and Robotics
- 4 Certificate in Wireless and fibre optic Communication and Mobile Technology.

## MODULE 1

### Overview

In this era of information technology, we are witnessing a silent revolution on audio visual revolution. Ignited from the emergence of electronic media and fuelled by the rapid development in information technology (such as 3G and 4G), the audio visual revolution has already spread up to almost all the corners of the world. The reflection of this global phenomena is quite evident in every phase of our life, no matter if it is a simple marriage video, a short film production from the school arts club or a live orchestra. Along with socio cultural changes it has brought about in the modern world, it has created a lot of job opportunities in the field of audio engineering. This module is so framed as to develop the skills required for various job roles related to this field. A simple look around will convince us that the number of job opportunities in this field will only multiply many times in the relevant years to come.

**List of expected skills**

- 1 Identify and test basic electronic components
- 2 Build and test a range of simple electronic circuits
- 3 Soldering circuits
- 4 Perform basic calculations and make accurate measurements using measuring instruments
- 5 Carryout basic fault finding
- 6 use voltmeters, ammeters, CRO, function generator etc
- 7 Trouble shoot simple circuits
- 8 Test and operate sound system without sound pollution
- 9 Make proper connections in sound system using appropriate cables and connectors
- 10 Foundation of sound engineering, familiarise audio studio console and operation
- 11 Maintenance of Audio system

**MODULE - 1****BASIC ELECTRONICS AND SOUND ENGINEERING**

<b>Unit No.</b>	<b>Name of Units</b>	<b>Periods</b>
1.	Introduction to sound Engineering	30
2.	Hobby circuits	180
3.	Audio Amplifier	60
4.	Audio Effects	40
5.	Audio Processing and Recording	30
	<b>TOTAL</b> (30% periods theoring and 70% periods practical)	<b>340</b>

Module 1 Unit : 1 INTRODUCTION TO SOUND ENGINEERING			
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>● Sound effect, fundamental units of Audio signal - Intensity, frequency, Pitch. Frequency range of audio signal.                             <ul style="list-style-type: none"> <li>- Observing</li> <li>- Measuring</li> <li>- Charting</li> <li>- Classifying</li> </ul> </li> <li>● Application of sound</li> <li>● Live Broadcasting</li> <li>● Film industry</li> <li>● AM/FM Studio</li> <li>- Understanding</li> <li>- Classification</li> <li>- Observation</li> <li>● Microphones and its use, symbol</li> <li>Moving coil microphone - working</li> <li>Various types of microphones and its connections</li> <li>● Specifications and characteristics of microphone                             <ul style="list-style-type: none"> <li>- Observing</li> <li>- Identifying</li> <li>- Examining</li> <li>- Handling</li> <li>- Explaining</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● Able to identify sound effect, unit of sound signal, unit of sound intensity, dB -measure the frequency.</li> <li>● Able to understand audio</li> <li>Electronics and fundamentals of sound</li> <li>● Able to understand the applications of sound</li> <li>● Able to explain the working of moving coil microphone.</li> <li>● Able to identify various types of microphones, Their specifications, and characteristics, Able to handle microphone safely.</li> </ul>	<ul style="list-style-type: none"> <li>● Demonstration of sound and sound effects using different equipment</li> <li>● Distribute different pamphlets or operational manuals of sound system (any company) and compare them</li> <li>● General Discussion</li> <li>Assignment</li> <li>● Demonstration of moving coil microphone and its parts.</li> <li>Demonstration of various types of microphones</li> <li>● Demonstrate a chart showing the various spec. And characteristics of microphones</li> </ul>	<ul style="list-style-type: none"> <li>● General discussion</li> <li>Activity log</li> <li>Chart</li> <li>● Assignment</li> <li>● General discussion</li> <li>Activity log</li> <li>Chart</li> <li>Practical work</li> </ul>



Unit : 1 INTRODUCTION TO SOUND ENGINEERING			
Module 1	Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities
	<ul style="list-style-type: none"> <li>• Loud speakers and its use, symbol of loud speaker</li> <li>• Moving coil loud speaker- working.</li> <li>• Different types of loud speakers and their identification.                             <ul style="list-style-type: none"> <li>- Observation</li> <li>- Identification</li> <li>- Handling</li> <li>- Explaining</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Able to explain the working of moving coil loud speaker.</li> <li>• Able to identify various types of Loud Speakers, their specifications</li> <li>• Able to handle Loud Speaker considering the safety precautions.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration Loud Speaker and its parts.</li> <li>• Demonstration of various types of Loud Speakers.</li> </ul>
Module 1	Assessment	Unit : 2 HOBBY CIRCUITS	
	<ul style="list-style-type: none"> <li>• General discussion</li> <li>• Activity log</li> <li>• Chart</li> <li>• Practical work</li> </ul>		
	<ul style="list-style-type: none"> <li>• Identification of components and their symbols in the given circuit.</li> <li>• Testing of Diode, Transistor.</li> <li>• Colour coding of resistors.                             <ul style="list-style-type: none"> <li>- Identify</li> <li>- Drawing symbols.</li> <li>- Calculation.</li> <li>- Testing.</li> <li>- Handling of instruments/safety precautions.</li> </ul> </li> <li>• Various techniques in soldering, solder and de solder on PCB.                             <ul style="list-style-type: none"> <li>- Experimenting.</li> <li>- Assembling.</li> <li>- Soldering and de soldering.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Able to identify the components and symbols of Resistor, Capacitor, Inductor, Diode, Transistor, LDR, IC,LED.</li> <li>• Able to test diode and Transistor using Multimeter</li> <li>• Able to handle Multimeter.</li> <li>• Able to solder and de solder circuits.</li> <li>• Able to trace the given hobby circuit.</li> <li>• Able to assemble the given hobby circuit.</li> </ul>	<ul style="list-style-type: none"> <li>• Collection of different components.</li> <li>• General discussion.</li> <li>• Hands on experiments.</li> <li>• Lab work.</li> <li>• Introduce EDA tools</li> <li>• General discussion.</li> <li>• Lab experiment.</li> <li>• Hands on experiment.</li> </ul>
	<ul style="list-style-type: none"> <li>• Involvement in collection.</li> <li>• Involvement in General discussion.</li> <li>• Lab work.</li> </ul>		<ul style="list-style-type: none"> <li>• Involvement in General discussion.</li> <li>• Lab work.</li> </ul>

Unit : 2 HOBBY CIRCUITS				
Module 1	Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
	<ul style="list-style-type: none"> <li>Define the terms- Current, Voltage, Resistance and statement of Ohm's Law.                             <ul style="list-style-type: none"> <li>- Explaining.</li> <li>- Engaging in experiments.</li> </ul> </li> <li>Concept of AC and DC, conversion of AC into DC</li> <li>Block diagram and explanation of Regulated DC Power Supply.                             <ul style="list-style-type: none"> <li>- Explaining.</li> </ul> </li> <li>Demonstration of A C and DC on CRO.</li> <li>Transistor and its applications.                             <ul style="list-style-type: none"> <li>- Demonstration.</li> <li>- Identifying leads.</li> </ul> </li> <li>Sensors and Modules. MOSFET and IGBT                             <ul style="list-style-type: none"> <li>- Demonstration</li> <li>- Identifying.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Able to define and differentiate the terms current, voltage and resistance.</li> <li>Able to measure current, voltage and resistance using multimeter.</li> <li>Able to verify Ohm's Law.</li> <li>Able to understand difference between AC and DC and their comparison.</li> <li>Able to identify and distinguish different sections of a Regulated DC Power Supply.</li> <li>Able to identify PNP and NPN transistor with the help of multimeter.</li> <li>Able to identify Emitter, Base, Collector.</li> <li>Able to identify different Sensors and Modules.</li> <li>Able to identify MOSFET and IGBT and their applications.</li> </ul>	<ul style="list-style-type: none"> <li>General discussion. Lab experiment. Hands on experiment.</li> <li>General discussion. Block diagram analysis. Demonstration. Chart preparation</li> <li>Demonstration and Group discussion.</li> <li>Demonstration and General discussion.</li> </ul>	<ul style="list-style-type: none"> <li>Involvement in General discussion. Lab work.</li> <li>Involvement in General discussion. Chart.</li> <li>Involvement in Group discussion.</li> <li>Involvement in General discussion.</li> </ul>

Unit : 3 AUDIO AMPLIFIER				
Module 1	Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	
	<ul style="list-style-type: none"> <li>• Audio Amplifier and its application. Amplifier using Transistor/ IC TBA 810. Gain of Amplifier, Noise.</li> <li>• Measurement of Amplitude and Frequency with the help of CRO and Function Generator.                             <ul style="list-style-type: none"> <li>- Observing.</li> <li>- Measuring.</li> <li>- Constructing knowledge.</li> <li>- Handling.</li> <li>- Explaining.</li> </ul> </li> <li>• Types of cables and connectors. Introduction of different types of audio cables and connectors and their applications.                             <ul style="list-style-type: none"> <li>- Observing.</li> <li>- Classifying.</li> <li>- Handling.</li> <li>- Examining.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Able to explain amplification, gain and noise.</li> <li>• Able to set up an audio amplifier and verify the performance.</li> <li>• Able to handle and operate signal generator and CRO.</li> <li>• Able to identify cables and connectors.</li> <li>• Able to perform proper usage of cables and connectors.</li> <li>• Able to classify the cables and connectors.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration. Practical work. Measurement of frequency and amplitude. Establish connections using proper connectors.</li> <li>• Demonstration.</li> </ul>	
			<ul style="list-style-type: none"> <li>• Genera discussion. Activity log. Practical log. Practical work.</li> <li>• Identification</li> </ul>	
Unit : 4 AUDIO EFFECTS				
Module 1	<ul style="list-style-type: none"> <li>• Mono and Stereo effects of sound. Setting up of simple Mixer and Equalizer. Installation and testing of Public Address System.                             <ul style="list-style-type: none"> <li>- Observing.</li> <li>- Engaging in experiments.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Able to identify and recognize Mono and Stereo effects of sound and different standards</li> <li>• Able to explain mixer and equaliser.</li> <li>• Able to make proper setting of Mixer and Equalizer.</li> <li>• Able to install and test a PA system, without noise pollution.</li> <li>• Able to explain Dolby system</li> </ul>	<ul style="list-style-type: none"> <li>• General discussion. Demonstration of Mono and Stereo effects. Hands on experiment. Lab. Work.</li> </ul>	<ul style="list-style-type: none"> <li>• Involvement in General discussion. Lab work. Activity log book.</li> </ul>

Unit : 5 AUDIO PROCESSING AND RECORDING			
Module 1	Learning Outcomes	Suggested Activities	Assessment
<p><b>Ideas/Concepts/Skill</b></p> <ul style="list-style-type: none"> <li>• Studio Mixer and its operation. Understand Routing and Panning, Phase reversal and Flip.                             <ul style="list-style-type: none"> <li>- Observing.</li> <li>- Classifying.</li> <li>- Charting</li> </ul> </li> <li>• Block diagram of Digital audio work station.</li> <li>• Concept of Equalisation, Band width and Gain.                             <ul style="list-style-type: none"> <li>- Charting.</li> <li>- Observing.</li> <li>- Demonstrating.</li> </ul> </li> <li>• Comparison of Graphic, Complementary and Automated Equalizers.</li> <li>• Introduce frequency Analyzer and Harmonic Generator.                             <ul style="list-style-type: none"> <li>- Observing.</li> <li>- Understanding.</li> <li>- Classifying.</li> <li>- explaining</li> </ul> </li> </ul> <p><b>PROJECT</b></p> <ul style="list-style-type: none"> <li>• Construct a LED lamp or a solar based Lamp</li> </ul>	<ul style="list-style-type: none"> <li>• Able to understand the block diagram of Mixer unit.</li> <li>• Able to route the channels which needs special effects.</li> <li>• Able to distinguish two types of Mixing boards.</li> <li>• Able to Penn the channels.</li> <li>• Able to understand about Digital Audio work station.</li> <li>• Able to identify the software used.</li> <li>• Able to identify equalisation controls.</li> <li>• Able to understand the differences between Graphic, Complementary, Automated Equalizers and able to identify the software used.</li> <li>• Able to identify Frequency Analyzer and Harmonic Generator.</li> <li>• Explain Doppler effect, Nyquist theorem and Sampling theorem</li> <li>• Able to construct a LED lamp or a Solar Based lamp</li> </ul>	<ul style="list-style-type: none"> <li>• Field visit. General discussion. Lab. Work on Mixer ie. Connecting- Operating- Adjusting.</li> <li>• Lab work- LPF and HPF. Demonstration and General discussion. Class tests. Assignment. Lab work on construction of audio Bass/ Treble board. General discussion.</li> <li>• Class room transacton</li> <li>• A project to construct a LED lamp /Solar base lamp(Hands own experience)</li> </ul>	<ul style="list-style-type: none"> <li>• Field visit diary. Lab work. Class test.</li> <li>• Class test. Lab work activity log.</li> <li>• Assignment. Lab work. Class test.</li> <li>• Activity log</li> <li>Neatness of the work Its presentation Working/ not</li> </ul>

Module 1 Unit : 5 AUDIO PROCESSING AND RECORDING			
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>• Construction of simple Equalizing circuits ( LPF and HPF).</li> <li>• Construction of Audio Bass/ Treble board.                             <ul style="list-style-type: none"> <li>- Constructing.</li> <li>- Observing.</li> </ul> </li> <li>Live Digital Recording.                             <ul style="list-style-type: none"> <li>- Observing.</li> </ul> </li> <li>• Brief description of Audio Studio schematic.</li> <li>• Audio recording room familiarisation.</li> <li>• Audio control room familiarisation.                             <ul style="list-style-type: none"> <li>Introduce Audio console.                                     <ul style="list-style-type: none"> <li>- Observing.</li> <li>- Charting.</li> <li>- Understanding.</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Able to construct simple Equalization (LPF andHPF)</li> <li>• Able to understand a Live Recording set up</li> <li>• Able to understand the set up of an Audio Studio using block diagram. Study about audio recording room and audio control room.</li> <li>• Able to understand the basics of Audio Console.</li> </ul>	<ul style="list-style-type: none"> <li>• General discussion. Lab experiment. Hands on experiment.</li> <li>• OJT, Field visit</li> <li>• Field visit. Group discussion. OJT. Chart preparation.</li> </ul>	<ul style="list-style-type: none"> <li>• Activity log. Practical log.</li> <li>• OJT report. Field visit diary.</li> <li>• Participation in Group discussion. Field visit diary. OJT work log. Chart preparation.</li> </ul>

**LIST OF PARTICALS****Module- 1; Basic Electronics and Sound Engineering**

<b>Expt.</b>	<b>Expt. Name</b>	<b>Facilities Required</b>
1	Assembling of any of the given audio hobby circuits on a general PCB	Soldering iron, PCB, components, RDS
2	Identification of components used in the above circuit and drawing their symbols	components
3	Testing of above components	Multi Meter,
4	Colour coding of Resistor	Different types of resistor
5	Assembling a regulated DC	Zener diode, Diodes, power supply capacitors, transformer, CRO, PCB soldering iron resistors
6	Assembling a dual power supply using IC	PCB, IC, Soldering iron CRO, Multi meter and other component
7	Assembling an audio amplifier using TBA810- mono and stereo	IC, PCB, Soldering iron, CRO, Multi meter
8	Construct a simple mixer and equalizer using IC 324	IC, soldering iron etc
9	Setting up a PA system using the above amplifier (construct a multi speaker system using tweeter woofer, cross over network)	Microphone, speaker amplifier, tweeter woofer, cross over network, enclosure box / baffle
10	Familiarization of audio console and other audio equipments used in a recording studio	OJT
11	Assembling of LED Lamp	Soldering Iron components, PCB

Tools, equipments and materials required:

**LIST OF TOOLS AND EQUIPMENTS (Module1)**

<b>Sl.No.</b>	<b>Description of Items</b>	<b>Qty.</b>
1	Digital Storage Oscilloscope 50MHz, Dual Channel	2
2	Digital Multimeter, 3.3/4' Display	5
3	Function Generator (0-10MHz)	2
4	DC Regulated Power Supply (0-30V/1Amp)	2
5	DC Regulated Power Supply (0-+30V/-30V/2Amp)	1
6	SMD Soldering , Desoldering station	1
7	Temperature controlled Soldering Station	2
8	Soldering Iron with Ceramic Element 15W	5
9	Soldering Iron with Ceramic Element 25W	5
10	Wire Stripper	5
11	Nose Plier 6"	5
12	Combination Plier 6"	5
13	Screw driver Set ( set of 6)	5
14	PA System Amplifier 500W	1
	Unidirectional Mic with cable and Stand	2
	Wireless Mic	1
	2 way Column speaker 250W	1
15	8 Channel Audio Mixer	1
16	15 Channel Equalizer with Effects	1
17	5.1 Channel Sound System with Subwoofer and Amplifier	1
18	Desk top Computer with 5.1 Channel Sound card	1



<b>Consumable items</b>	
1	¼ W Resistor Assorted values
2	Capacitors Ceramic and Electrolytic assorted values
3	Diodes 1N4007/5402/5406
4	Transistors BC547/557/107/177
5	Zener Diodes
6	FET,MOSFET,SCR,TRIAC,DIAC,UJT,IGBT
7	3 Terminal Voltage Regulator IC LM 7805/7812,LM7905/7912
8	Comparator IC LM324
9	Sensor and Sensor Modules(Light/Temp/Gas/Smoke/IR/Ultra Sound and Proximity)
10	Audio Power Amplifier IC
11	12V Cube Relay
12	Transformer 6-0-6/500mA,12-0-12/2Amp,12-0-12/5Amp
13	Connecting Wire 1/22 Hook up wire,7/36 Flexible wire 5
14	Solder 60/40 ,18SWG
15	Solder less Bread Board 10

## Overview of Module 2

This module introduces essential concepts of Digital Electronics and Digital computer fundamentals. Also the aim of this module is to equip the learners to install and trouble shoot computer hardware, UPS, and SMPS. Also they will be able to make successful LAN and WAN connections.

### List of Expected Skills:

- Verify the truth tables of gates
- Identify, install, configuration, test and troubleshoot computer hardware components
- Trouble shoot UPS& SMPS
- Identify various network media needed to make successful LAN and WAN connections.
- Connecting and configuring computers , switches and routers into LAN

## Digital Electronics HARDWARE AND NETWORKING

Unit No.	Name of Units	Periods
1.	Digital Electronics	50
2.	Input Output devices	30
3.	Mother board and CPU	40
4.	Memory Device	50
5.	Operating System	30
6.	computer Networking	140
	<b>Total</b> (30% periods theoring and 70% periods practical)	<b>340</b>

Module 2 Unit : 1 Digital Electronics			
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>Digital and analog systems</li> </ul>	<ul style="list-style-type: none"> <li>Explain Digital and analog system.</li> </ul>	<ul style="list-style-type: none"> <li>General discussion on digital and analog system.</li> </ul>	<ul style="list-style-type: none"> <li>Activity log</li> <li>chart</li> </ul>
<ul style="list-style-type: none"> <li>Binary number system Logic gates. (OR, AND, NOR, NAND, NOT)                             <ul style="list-style-type: none"> <li>Explains</li> <li>Compares</li> <li>Computing</li> <li>Recognizes</li> </ul> </li> <li>Perform experiments and verify</li> </ul>	<ul style="list-style-type: none"> <li>The reason for the shift to digital technology.</li> <li>Identify binary number system.</li> <li>convert decimal; no into binary and vice versa</li> <li>identify basic gates</li> <li>verify the Truth table</li> </ul>	<ul style="list-style-type: none"> <li>Demonstration chart preparation. Verify truth table in the lab.</li> <li>General discussion experimenting</li> </ul>	<ul style="list-style-type: none"> <li>Activity log</li> <li>Practical log</li> <li>Practical work chart</li> </ul>
<ul style="list-style-type: none"> <li>Encoder, Decoder, Multiplexer, demultiplexer counter , Flip Flop , register</li> <li>Observing</li> <li>Classifying</li> <li>Using relationships</li> </ul>	<ul style="list-style-type: none"> <li>Explain Encoder</li> <li>Defines Decoder</li> <li>Explain multiplexer</li> <li>Explain demultiplexer</li> <li>Explain counter</li> <li>Explain Flip Flop</li> <li>Explain register</li> </ul>	<ul style="list-style-type: none"> <li>General discussion on digital logic functions- encoder, decoder, mux, demux, counter, flip flop, register</li> <li>Explains the operational differences</li> </ul>	<ul style="list-style-type: none"> <li>Activity log</li> <li>Worksheet</li> </ul>
<ul style="list-style-type: none"> <li>Study of different parts of a computer system</li> <li>Block diagram Explanation</li> <li>Identifying</li> <li>Observing</li> <li>Classifying</li> <li>Charting</li> </ul>	<ul style="list-style-type: none"> <li>Identify the different parts of a computer and its functions.</li> <li>explain about the functions of each block</li> </ul>	<ul style="list-style-type: none"> <li>Demonstration</li> <li>General discussion</li> <li>Chart preparation</li> </ul>	<ul style="list-style-type: none"> <li>Activity log</li> <li>Practical log</li> <li>Chart</li> </ul>
<ul style="list-style-type: none"> <li>Explaining SMPS</li> <li>Working with BD</li> <li>UPS - Working and familiarisation.</li> </ul>	<ul style="list-style-type: none"> <li>Identify SMPS parts.</li> <li>explain this B.D</li> <li>measure this O/P</li> <li>Identify UPS parts.</li> </ul>	<ul style="list-style-type: none"> <li>Demonstration general discussion dismantle and reassemble SMPS and UPS</li> <li>Measurement of O/P</li> </ul>	<ul style="list-style-type: none"> <li>Activity log</li> <li>Practical work</li> <li>Practical log</li> <li>Class Test.</li> </ul>

Unit : 2 Input and output devices

Module 2			
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>• Observing</li> <li>• Measuring</li> <li>• Assembling</li> <li>• Soldering</li> <li>• De soldering</li> </ul>			
<p>Familiarisation of Basic input devices.</p> <ul style="list-style-type: none"> <li>• Keyboard</li> <li>• Mouse</li> <li>• Audio port</li> <li>• Scanner</li> <li>• Webcam</li> </ul> <p>And other i/P devices and their use</p> <ul style="list-style-type: none"> <li>• Identification</li> <li>• Classification</li> <li>• recognition</li> </ul>	<ul style="list-style-type: none"> <li>• Identify keyboard and its connections.</li> <li>• Identify types of keyboard.</li> <li>• Identify and safely connect mouse.</li> <li>• Identify the types of mouse.</li> <li>• Identify audio port and its connection.</li> <li>• Identify the scanner and its install and setup a scanner</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration</li> <li>• Installation</li> <li>• Identification</li> </ul>	<ul style="list-style-type: none"> <li>• Activity blog</li> <li>• Practical log</li> <li>• Practical work chart</li> </ul>
<p>Familiarization of Basic O/P devices.</p> <p>Monitor Modems Printer Headset, audio cards</p> <ul style="list-style-type: none"> <li>• Identifying</li> <li>• Demonstrating</li> <li>• recognizing</li> </ul>	<ul style="list-style-type: none"> <li>• Identify types of monitor and its connections.</li> <li>• Identify internal external modems and its connections.</li> <li>• identify O/P ports</li> <li>• setup a printer</li> <li>• connect Speakers, headsets etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration of various devices</li> <li>• O/P</li> </ul>	<ul style="list-style-type: none"> <li>• Identification</li> <li>• Demonstration</li> </ul>

Unit : 3 Mother board and CPU				
Module 2	Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
	<ul style="list-style-type: none"> <li>• Familiarisation of parts of a mother board Interfacing of Mother Board.</li> <li>• Comparative study of RAM, DRAM, SRAM, SDRAM, DDRAM.</li> <li>• Observation</li> <li>• Classification</li> <li>• Demonstration</li> <li>• Identify</li> <li>• Compare</li> <li>• Explain</li> </ul>	<ul style="list-style-type: none"> <li>• Familiarize with the types of mother board.</li> <li>• Identify different pins, ports, sockets in Mother Board.</li> <li>• Assemble and dismantle cooling fan and CPU in mother board.</li> <li>• Identify different memory modules.</li> <li>• explain different Processors, speed, cores and RA</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration</li> <li>• Practical work</li> <li>• Demonstration</li> <li>• Practical work</li> </ul>	<ul style="list-style-type: none"> <li>• Practical work</li> <li>• Identification</li> <li>• Practical logbook.</li> </ul>

Module : 2

Unit : 4 Memory Devices

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>• RAM,ROM,PROM,EPROM Comparison RAM &amp; ROM</li> <li>• ROM - Type's expansion cards CD, DVD, USB, Drives pen drive, external hard drive, and graphics card.</li> <li>• Identification</li> <li>• Classification</li> <li>• Understanding</li> <li>• Assembling skill</li> <li>• Different types of processors. Safety and security Trouble shooting of PC.</li> <li>• Familiarisation of Lap Top Note Book</li> </ul>	<ul style="list-style-type: none"> <li>• Identify the storage devices.</li> <li>• Explain the advantages of each storage device and its max, capacity.</li> <li>• assemble a computer</li> <li>• trouble shoot a computer</li> <li>• Take care of the safety persecutions.</li> <li>• explain mod identify Lap top, Note book etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration</li> <li>• Video show</li> <li>• Practical work</li> <li>• Video show</li> <li>• Demonstration</li> <li>• Identification</li> </ul>	<ul style="list-style-type: none"> <li>• Activity log</li> <li>• Identification</li> <li>• Practical logbook.</li> <li>• Identification chart</li> <li>• Activity log.</li> </ul>

Module 2 Unit : 5 Operating System			
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<p>Operating system</p> <ul style="list-style-type: none"> <li>● Windows</li> <li>● Installation methods</li> <li>● Ubuntu</li> <li>● Linux</li> <li>● Free Software</li> </ul> <p>ALU Control Unit</p> <p>Installation Procedure</p> <ul style="list-style-type: none"> <li>- Practical skill</li> <li>- Proper handling</li> <li>- Observation</li> <li>- Identification</li> </ul> <p>E-waste</p>	<ul style="list-style-type: none"> <li>● Explain about OS.</li> <li>● Install OS in a system.</li> <li>● Do formatting and partitioning of HDD.</li> <li>● Explain different steps in installation procedure.</li> <li>● Trouble shoots a PC.</li> <li>● Install other Software.</li> <li>● Install different i/P, O/P devices.</li> <li>● Use proper cables</li> </ul>	<ul style="list-style-type: none"> <li>●</li> </ul>	<ul style="list-style-type: none"> <li>● Ability to install software</li> <li>● Proper procedure</li> <li>● Handling</li> <li>● Proper usage of tools</li> </ul>
	<ul style="list-style-type: none"> <li>● Explain e-waste</li> <li>● Explain illeffects of e-waste</li> <li>● Explain how to minimise e-waste</li> <li>● Dispose e-waste safely</li> </ul>	<ul style="list-style-type: none"> <li>● Case study</li> <li>● Survey</li> <li>● Interaction with experts</li> <li>● Video show</li> <li>● Expert seminar</li> </ul>	<ul style="list-style-type: none"> <li>● Survey report</li> <li>● Case study report</li> <li>● Project report</li> </ul>



Unit: 6 computer Networking

Module 2

Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>• Introduction to networking.</li> <li>• Need for networking</li> <li>• Understand different network topologies.</li> <li>• Bus, star, Ring Tree etc.</li> <li>• Observing</li> <li>• Identifying</li> <li>• Inferring</li> </ul>	<ul style="list-style-type: none"> <li>• Explain about computer networking.</li> <li>• Identify the components in a computer network.</li> <li>• Identify the cables and connectors used in a computer network.</li> <li>• Identify and use router and switches.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration</li> <li>• Chart preparation</li> <li>• General discussion</li> <li>• Practical work</li> </ul>	<ul style="list-style-type: none"> <li>• Practical work</li> <li>• Chart</li> <li>• Activity log</li> <li>• Practical log</li> <li>• Worksheet.</li> </ul>
<p>LAN</p> <p>Compare LAN, MAN, WAN</p> <ul style="list-style-type: none"> <li>• Understanding</li> <li>• Comparing</li> <li>• Observing</li> <li>• Executing</li> <li>• Practical work</li> </ul> <p>Router - Bridge</p> <p>Gate way, Hun switch world wide web, Wireless LAN</p> <p>Wireless node, Wifi Bluetooth</p> <ul style="list-style-type: none"> <li>• UDP and TDP</li> </ul> <p>Explains</p>	<ul style="list-style-type: none"> <li>• Explain about LAN.</li> <li>• Compare LAN, MAN and WAN.</li> <li>• Identify the components used for setting up a LAN.</li> <li>• set up a simple LAN</li> <li>• Identify and differentiate cables and connectors. Used for networking.</li> <li>• Identify the components of a network.</li> <li>• explain the use of each component</li> <li>• use the proper component</li> <li>• use crimping tool</li> <li>• select and use connectors</li> <li>• Setup a Network with server and nodes.</li> <li>• explain wireless LAN, wireless node, Wifi, blue tooth</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration</li> <li>• Explanation</li> <li>• Practical work</li> <li>• Video show</li> <li>• OJT</li> <li>• Demonstration</li> <li>• Explanation</li> <li>• Practical work</li> <li>• Video show</li> <li>• OJT</li> </ul>	<ul style="list-style-type: none"> <li>• Activity log</li> <li>• Practical work</li> <li>• Worksheet</li> <li>• Worksheet</li> <li>• Practical work</li> <li>• Activity log</li> <li>• Identification skill.</li> </ul>

## LIST OF PRACTICALS

## Module - 2

Sl. No	Expt. Name	Facilities Required
1	Truth table verification	RPS Bread board, NOT, NOR, NAND, LED, Resistor, XOR Gates
2	SMPS Parts identification and circuit tracing (voltage measurement)	SMPS broad, Multi meter
3	UPS – Parts identification, maintenance and Battery Replacement	UPS, Multi meter Soldering iron
4	Familiarization of input devise of a computer	Keyboard, Mouse, Speaker, Webcam, Scanner
5	Familiarization of output devise of a computer	LED display, LCD display, Printer
6	Printer installation and maintained- replacement of cartridge / ribbon	Printer, CD
7	Mother board – familiarization of parts and interfacing	Various types of Mother boards
8	Assemble and dismantle cooling fan and CPU	CPU, cooling fan Mother board
9	System assembling and setting up peripheral devices	PC Kit
10	Installation and formatting of different operating system	Various OS packages
11	Laptop parts identification of parts and maintenance (keyboard, drives memory, battery)	Laptop
12	Setting up a basic network using a server and a router (IP setting, cable connecting, testing)	Crimpling Tools, cable tester, connectors (RJ45)
13	Setting up on internet communication	Pc modem, telephone connection

Tools, equipments and materials required:

**Module 2**

<b>Sl.No</b>	<b>Specification</b>	<b>Quantity</b>
1	Connecting screwdriver 100 mm	10nos.
2	Neon tester 500 V.	10nos.
3	Screw driver set (set of 5 )	10 nos.
4	Insulated combination pliers 150 mm	10 nos.
5	Insulated side cutting pliers 150 mm	10 nos.
6	Long nose pliers 150 mm	10 nos.
7	Soldering iron 25 W. 240 V.	10 nos.
8	Electrician knife	10 nos.
9	Tweezers 100mm	10 nos.
10	Digital Multimeter	10 nos.
11	Soldering Iron Changeable bits 15 W	10 nos.
12	De- soldering pump	10 nos.

**B. LIST OF TOOLS REQUIRED**

<b>Sl .No</b>	<b>Specification</b>	<b>Quantity</b>
1.	Crimping tool (pliers)	2 Nos.
2.	Soldering Iron 25W	6 Nos.
3.	Magneto spanner set	2 Nos.
4.	Screw driver 150mm	4 Nos.
5.	Steel rule 150mm	2 Nos.
6.	Scriber straight 150mm	2 Nos.
7.	Soldering Iron 240W	1 Nos.
8.	Allen key set (set of 9)	2 Nos.
9.	Tubular box spanner (set of 6nos)	1 No
10.	Magnifying lenses 75mm	3 Nos.
11.	Continuity tester	6 Nos.
12.	Soldering iron 10W	6 Nos.
13.	Cold chisel 20 mm	1 No.
14.	Scissors 200 mm	1 No.
15.	Handsaw 450 mm	1 No.

**B. Tools & Equipments (Computer Hardware: Installation and Maintenance)**

Sl. No.	Name of the Equipment	Qty
1	Server Computer	01 no
2	Desktop Computer	10 nos
3	Laptop, Notebook	01 each
4	Printers: LaserJet, DeskJet,	01 each
5	5KVA online UPS	01nos
6	LAN Cards, Wi-Fi LAN Cards	06 nos each.
7	LCD/DLP Projector	01 no
8	Crimping Tools	06 nos
9	Motherboards (of different make)	5nos
10	Cabinets	5nos
11	Processors (of different make)	5nos
12	Hard Disk (500 GB/1TB)	5nos
13	Optical Drives	5nos
14	LCD/LED Monitors HDMI Port	2nos
15	Pen Drives	4 nos
16	External Hard disk	2 nos
17	External DVD Writer	2 nos
18	Keyboards	4 nos
19	Mouse	4 nos
20	Anti static pads	4 nos
21	Anti static wrist wraps	4 nos
22	SMPS 400W	4 nos
23	Blu-Ray drive and player	1 no
24	Digital Camera	2 nos
25	Card Reader	2 nos
26	Web Cam	2 nos
27	2.1 Surround sound system	2 nos
28	Different types of memory cards	2 nos each
29	Wireless Network Adapter	10 nos
30	Wireless Access Point	6 nos

Module 1 Unit : 1 INTRODUCTION TO SOUND ENGINEERING			
Ideas/Concepts/Skill	Learning Outcomes	Suggested Activities	Assessment
<ul style="list-style-type: none"> <li>• Sound effect, fundamental units of Audio signal - Intensity, frequency, Pitch. Frequency range of audio signal.                             <ul style="list-style-type: none"> <li>- Observing</li> <li>- Measuring</li> <li>- Charting</li> <li>- Classifying</li> </ul> </li> <li>• Application of sound</li> <li>• Live Broadcasting                             <ul style="list-style-type: none"> <li>- Film industry</li> <li>- AM/FM Studio</li> <li>- Understanding</li> <li>- Classification</li> <li>- Observation</li> </ul> </li> <li>• Microphones and its use, symbol Moving coil microphone - working Various types of microphones and its connections</li> <li>• Specifications and characteristics of microphone                             <ul style="list-style-type: none"> <li>- Observing</li> <li>- Identifying</li> <li>- Examining</li> <li>- Handling</li> <li>- Explaining</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Able to identify sound effect, unit of sound signal, unit of sound intensity, dB -measure the frequency.</li> <li>• Able to understand audio Electronics and fundamentals of sound</li> <li>• Able to understand the applications of sound</li> <li>• Able to explain the working of moving coil microphone.</li> <li>• Able to identify various types of microphones, Their specifications, and characteristics, Able to handle microphone safely.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration of sound and sound effects using different equipment</li> <li>• Distribute different pamphlets or operational manuals of sound system (any company) and compare them</li> <li>• General Discussion</li> <li>• Assignment</li> <li>• Demonstration of moving coil microphone and its parts. Demonstration of various types of microphones</li> <li>• Demonstrate a chart showing the various spec. And characteristics of microphones</li> </ul>	<ul style="list-style-type: none"> <li>• General discussion</li> <li>• Activity log</li> <li>• Chart</li> <li>• Assignment</li> <li>• General discussion</li> <li>• Activity log</li> <li>• Chart</li> <li>• Practical work</li> </ul>

## Towards the Unit

### **Module : I      Basic Electronics and Sound Engineering**

#### **Unit      1      Introduction to Sound Engineering:**

This unit is an introduction to the field of sound engineering. Unit starts with the observation of different sounds and their classification. The discussion gradually develops to difference between various sounds and the basic qualities related to sound. The concept of frequency, pitch and intensity of sound are presented. The audible range of frequency of sound is explained. The applications of sounds in various fields are then detailed. The unit concludes with the introduction of microphones and loud speakers, the two important acoustic transducers used in sound engineering. Various models of both are discussed with emphasis on their specific field of application.

- Sound Effect
- Fundamental limits of Audio Signal
- intensity, frequency and pitch
- Frequency range of Audio Signals

#### **Suggested Activity**

- Starts with playing sounds from different sources such as mobile phone, F M radio, CD players, Laptop....etc.
- Students are asked to listen and enjoy the music
- Teacher asks them how many different sounds they are able to identify.
- They are allowed to explain the difference they felt between sounds
- Finally the teacher gives a consolidation explaining the basic units and frequency range of sound signals

#### **Facilities Required**

Mobile phone / Laptop / CD players / FM radio / I pad / any audio instrument

#### **Content**

- Application of sound - live sound
- Broadcasting sound
- Recording studio
- Film Industry

### Suggested Activity

- Arrange a live demonstration of application of sounds in various field such as live broadcasting, studio, film... etc either using laptop or mobile, internet.
- Let them watch these sounds very closely and understand them.
- Ask them to prepare a table of application in their activity log.
- Suggest them to expand the table by adding more and more sound in this table.

### Facilities Required

Laptop / Mobile / Internet.

### Content - Sound Input

- Microphone - symbol and use
- Moving coil microphone working
- Various type of microphone and their application

### Suggested Activity - Class room Demonstration

- The teacher enters the class with a microphone in hand.
- The students are allowed to use it and observe it.
- Teacher explains the principle of working.
- The whole class is divided into three or four groups.
- Each group is instructed to prepare a chart of various microphone- their specifications and their uses .(palm lets of different companies or operational manuals can be used)
- The model of the chart may be as below

Sl. No.	Type of microphone	Specification	Picture	Price

### Facilities Required

Microphone / Amplifier / Loudspeaker

**Content - Sound Output**

- Loudspeaker - symbol and use
- Moving coil loudspeaker
- Various types of loudspeaker and their application

**Suggested Activity - classroom Demonstration**

- As an extension of the previous activity the teacher explain the working and symbol of a loudspeaker.
- The working principle of a moving coil loudspeaker is explained in detail.
- The effect of baffles and enclosure are mentioned
- The group divided for the pervious activity are asked to prepare a similar chart for loudspeakers also

**Facilities Required**

Moving coil microphone / Amplifier /loudspeaker

**Practical Assessment**

- Identification of parts of microphone

**TE questions**

1. Pick out the audio frequency range from the folowing
  1. .5 to 10 Hz    b) 20Mz to 200Mz    c) 20 Hz to 20KHz
2. Studio recording one field of application in sound Engineering. List out any two other field of application?
3. Diaphragm is a part of a microphone. List out the other two parts of microphone.
4. Electromagnetic induction is the working principle of Loud Speaker. Do you agree with this statement?
5. Fill up

Equipment	Field of application
Tie clip microphone	
Tweeter	
Woofers	
	Mobile phone



6. Some audio equipment is with single LS and others with two LS. Give the effect of sound in both two types. Draw block diagram of a stereo system.

7. Fill up

Equipment	Field of application
Tie clip microphone	
Tweeter	
Woofers	
	Mobile phone

8. Write the colour code of the following resistors

Resistor values	Colour codes
1K $\Omega$	
2.2K $\Omega$	
10K $\Omega$	
470 $\Omega$	

9. Give the symbols of the following components

a) Capacitor   b) PNP transistor   c) Diode   d) LDR   e) variable resistor

10. A 10 $\Omega$  resistor is connected across a 20V battery, Find out the current in the given circuit ?

11. Draw a 6V ac signal and a 12V dc signal graphically.

12. Common emitter amplifier is normally used for amplification. Draw the circuit of a common emitter amplifier and explain its working.

13. Suma was confused in connecting a microphone with an amplifier using cable. Suggest a suitable cable for that purpose and list out three types of audio cables.
14. Some audio equipments are with single loud speaker and some others with two loud speaker. Give the effect of sound in both two types and draw the schematic of a stereo sound system.
15. Microphone, Loudspeaker, Amplifier are some parts of a PA system. Give the block diagram of a PA system and explain it.
16. Audio processing is associated with frequency analyser and harmonic generator equipments. List the requirements of the above equipments.

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- 2 A.Anandkumar,Fundamentals of digital circuits
- 3 B.Govinda Rajulu, IBM PC clones -
- 4 Scott Muller, Upgrading and Repairing PCs
- 5 Prakash C Gupta, Data Communication
- 6 Mark Minasai, The Complete PC Upgrading & Maintenance
- 7 Winne L Roseth Hardware Bible, Dream Tech
- 8 Stephen J Bigelow, Troubleshooting, maintaining & Repairing PCs
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