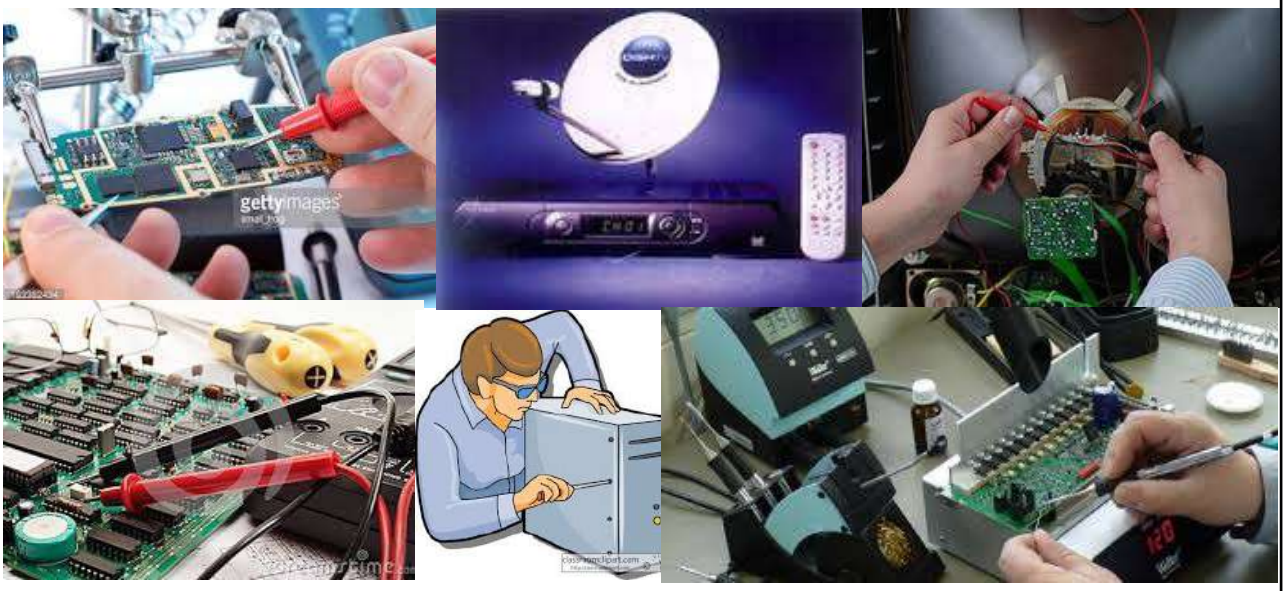
National Skills Qualification Framework (NSQF)
Competency Based Curriculum
Level 1 (Class 9) to Level 4 (Class 12)

ELECTRONICS TECHNOLOGY

Job Roles: Electronics Technician, Computer Hardware and Networking Technician, DTH and Solar Electronics Technician (QP Ref. Id:ELE/Q8101 and ELE/Q5901)



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NCERT

Vetted By
PSS Central Institute of Vocational Education, Bhopal
(a constituent unit of NCERT, under Ministry of Human Resource Development, Govt. of India)

CURRICULUM:
Electronics Sector for NSQF Level 1 (Class 9) Level 4 (Class 12)
Job Roles: Electronics Technician, Computer Hardware and Networking Technician, DTH and Solar Electronics Technician

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Preface

Ministry of Human Resource Development, Government of India developed the National Skill Qualification Framework (NSQF) to introduce vocational courses from class 9th onwards. The NSQF organizes qualifications according to a series of levels of knowledge and skills. These levels are defined in terms of learning outcomes i.e. the competencies (knowledge, skills and attitude) which the learners must possess regardless of whether they were acquired through formal, non-formal or informal education and training system. Qualifications are made up of occupational standards for specific areas of learning units or unit of competency. Units of competency are the specification of knowledge and skill and the application of that knowledge and skill to the standard of performance expected in the workplace. The unit of competency or National Occupation Standards comprising generic and technical competencies an employee should possess are laid down by the Sector Skill Council of the respective economic or social sector.

Competency is defined in terms of what a person is required to do (performance), under what conditions it is done (conditions) and how well it is to be done (standards). It can be broadly categorized into foundational, practical and reflexive competencies. Generic competencies are considered essential for a person to participate effectively in the workforce, whereas technical competencies are an individual's knowledge and expertise in the specific group task and its processes and its rules and regulations.

The competency based curriculum is broken down into coherent parts known as Units. Each unit is further broken down into knowledge and skills on the basis of which evidence is to be provided by the learner and the evaluation is to be done by the teacher or trainer.

PSSCIVE which is part of NCERT New Delhi is mandated by Government of India as a apex R&D Institute for Vocational Education. The institute has taken up development of Curriculum and course-ware for NSQF Level 1 (class 9) to Level 1 (class 12) to introduce vocational courses in Secondary and senior secondary schools in of the country.

The above curriculum on Electronics Technology is developed by a team of experts deputed by Directorate of Vocational Education and Training, Mumbai, Maharashtra and vetted by PSSCIVE faculty and coordinator. It is expected that the student workbook and teacher guide will be developed soon to start the course from this academic year 2015-16.

Dr. R. B. Shivagunde
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Introduction

The National Skills Qualification Framework (NSQF) developed by the Ministry of Human Resource Development (MHRD), Government of India is a descriptive framework that provides a common reference for linking various qualifications. It is used for setting common principles and guidelines for a nationally recognized qualification system covering Schools, Vocational Education and Training Institutions, Technical Education Institutions, and Universities/Colleges.

The NSQF organizes qualifications according to a series of levels of knowledge and skills. These levels are defined in terms of *learning outcomes* i.e., the *competencies* (knowledge, skills and attitude) which the learners must possess regardless of whether they were acquired through *formal, non-formal or informal* education and training system. *Qualifications* are made up of *occupational standards* for specific areas of learning units or unit of competency. *Units of competency* are the specification of knowledge and skill and the application of that knowledge and skill to the *standard of performance* expected in the workplace. The Unit of competency or National Occupation Standards comprising generic and technical competencies an employee should possess are laid down by the Sector Skill Council of the respective economic or social sector.

The **competency based curriculum** is broken down into coherent parts known as **Units**. Each unit is further broken down into knowledge and skills on the basis of which evidence is to be provided by the learner and the evaluation is to be done by the teacher or trainer.

After successful completion of this course from Level 1 (Class 9) to level 4 (Class 12), students will be able to perform job role of Web Developer. Student can also go for higher education in degree courses in engineering and science science stream.

About the Sector

The discovery of electricity is one of the greatest achievements of man. Its use has made our lives so comfortable that, today, scientists in all countries are trying their utmost to use it more and more for all purposes.

Electricity has helped to remove darkness and increase human activity. Powerful lights are used in factories, schools, hospitals and in all other dark places where men have to work for the benefit of others or for themselves. Men are able to go anywhere even in the darkest of nights.

Electricity has also enabled men to increase the production of their goods. Huge machines are operated in large factories with the help of electricity for the manufacture of useful goods. These machines work ceaselessly and produce enormous quantities of goods, which are distributed throughout the world, for the comfort of people in all parts of the earth.

Electricity has become quite common in today's world. Everybody loves what it can do and loves the level at which it is being used. The street lights work on electric current. Fans in the court, office rooms, homes, etc. all work on electricity. Trains and trams too run on the power on electricity. Hence electricity is no longer a strange thing.

We need human resource for repairing and maintenance of electrical and electronics devices. This curriculum is for the technician doing repair and maintenance of electrical gadgets. After successful completion of level-I, the students will be able to understand the fundamental of Electricity and Electronics, after the completion of level-II the students will be able to perform the job role of Domestic Appliances Technician, after the completion of level-III the job roles of Wireman ,Home Appliances Technician ,Electrician Helper , House Wiring Technician ,and after the completion of level-IV the job roles of Field Technician-Industrial & Commercial wiring, Home Electric Technician, D.G.Set Operator ,House Wiring Technician, Electrician, Panel wiring Technician, Maintenance Operator-LT & HT Substation, Owner of Electrical Wiring accessories shop. After completion of all the levels the students can select the vocation of his choice or pursue higher studies including diploma, graduation, post-graduation or obtain specialized diploma in any of the job roles to become supervisor in the industry.

Objectives of the Course

Upon completion of this course, students will be able to:

- To provide an over all view of the Fundamentals of Electricity, Electronics and Measurements and Electronics workshop
- Workshop practice provides the safety measures of equipments and electricity and awareness of workshop layout.
- To provide reading of voltage, current along with various laws.
- To provide the concept of atomic structure along with active and passive components and its uses.
- To provide an overview of the Fundamentals of Analog and Digital Electronics, Electronic Power Supplies, Storage Battery and Soldering of Electronic circuits.
- To provide the knowledge of active components construction and its working.
- To provide the knowledge of digital fundamentals and its application.
- To provide the concept of power supply and its uses.
- To provide the concept of soldering techniques.
- To provide the knowledge of SMD components and its mounting on PCB and testing of SMD components
- To provide the knowledge concept of logic adder, substractor and flip flop along with A to D converters.
- To provide the knowledge of DTH Installation and its working function.
- To provide the knowledge of working of digital CRO and its applications.
- To provide an overview of Computer Hardware maintenance and troubleshooting.
- To provide the concept of microprocessor block diagram, working function along with its application.
- To provide the knowledge of solar system and its applications.
- To introduce power electronics components and characteristics
- To provide the concept and working function of UPS and Inverters.
- Upon completion of this course, students will be able to: Designing, Troubleshooting and rectifying the Computer Network.

Classroom Activities: Classroom activities are an integral part of this programme and interactive lecture sessions, followed by discussions should be conducted by trained teachers. Teachers should make effective use of a variety of instructional aids, such as Videos, Colour Slides, Charts, Diagrams, Models, Exhibits, Handouts, Recorded Compact Discs, etc. to transmit knowledge in projective and interactive mode.

Practical Activities: Activities that provide practical experience through case based problems, role play, games, etc. and practical exercises using props, tools and equipment should be regularly organized off-the-job and on-the-job. Equipment and supplies should be provided to enhance hands-on experiences to students in the chosen occupation. Trained personnel should teach specialized techniques such as dismantling and assembling of computer parts, servicing of computers, operating Web programming, etc.

On-the-Job Training: On-the-job training (OJT) occurs whenever more experienced employee or supervisor teaches less experienced person on how to do one or more tasks of a job. The training utilizes actual equipment and materials. OJT should be undertaken in a structured manner with a training plan under the supervision of an experienced trainer or supervisor. A training plan that reflects tasks to be performed and competencies to be imparted should be prepared and signed by the student, teacher, and supervisor at the workplace for training of the students in the organization/industry. The trainer should break down all the steps of the job and train the students as per the training plan. In a structured OJT, the following steps should be followed:

Step 1: The Instructor or the trainer tell, show, demonstrate, and explain. The trainer gives an overview of the task while explaining the constructional details and use of the tools, equipment, materials, etc. in performing the tasks.

Step 2: The Instructor or the trainer demonstrates each step in detail, actually doing the steps of the task and explaining each step, one at a time, while the trainee watches. The steps may not necessarily be demonstrated in the sequence of actual operation, as sometimes it is better that simple tasks are demonstrated first to build confidence. Showing finished products at each appropriate step will help the leaner understand what is required as outcome. While demonstrating, the trainer explains why each step is done in the way it is done.

Step 3: It involves direct trainee participation. The trainer monitors the progress on a checklist of competencies and offers feedback and pointers where and when needed.

Step 4: The trainee practices with clearly defined targets for performance standards.

Certification: Upon successful completion of this course, the State Education Board and the IT-ITeS Sector Skill Council will provide a certificate to the student verifying the competencies acquired by the student. For more details about SSC visit the website of NASSCOM at http://www.nasscom.in/itites-sector-skill-council.

Competency Based Curriculum for NSQF Level 1 (Class 9)

Sector: Electronics, Job Role: Electronics Technician, Electronics Component Tester, Digital Electronics Laboratory Attendant, Storage Battery Technician, Soldering Technician

Objectives:

Upon completion of this course, students will be able to:

- To provide an over all view of the Fundamentals of Electricity, Electronics and Measurements and Electronics workshop
- Workshop practice provides the safety measures of equipments and electricity and awareness of workshop layout.
- To provide reading of voltage, current along with various laws.
- To provide the concept of atomic structure along with active and passive components and its uses.

Course Structure: This course (vocational qualification package) is a planned sequence of instructions consisting of the following modules, called as Units.

Sn	Unit Code	Unit Title	Theory	Practical	Total
1	IT-ED-101	Workshop Practice	20	20	40
2	IT-ED-102	Basic Electricity	20	20	40
3	IT-ED-103	Basic Electronics (Elementary)	20	20	40
4	IT-ED-104	Electronic Components (Elementary)	20	20	40
5	IT-ED-105	Electrical and Electronics Measurements	20	20	40
		Total Hours	**100**	**150**	**200**

RELEVANT SKILLS (Generic)

- Reading skill
- Writing skill
- Communication skill
- Language skill
- Behavioral skill
- Observation
- Listing skill
- Handling tools
- Electronic Measurements

Teaching and Training Methods: Theory with Demonstration and Practical Hands on

Location for Training: Classroom and Practical Laboratory

UNIT CODE & TITLE	**ET-101: Workshop Practice**	
UNIT DESCRIPTOR		
DURATION	40 Hrs (Theory& Demonstration: 20 Hrs, Practical Hands on: 20 Hrs)	
LEARNING OUTCOME	**PERFORMANCE CRITERIA**	**RELEVANT KNOWLEDGE**
Introduce with Electronics Workshop Practice	Overlook electronics workshop visually Read various Dos and Don'ts in the Laboratory Locate various entry and Exit points Locate Notice Boards Read out Lab / Workshop Rules Discuss queries and doubts	Electronics Laboratory location, rules and regulations
Draw a Physical Layout	Measure dimensions of laboratory, various furniture, entry and exit Draw a physical layout of laboratory on A3 size drawing paper Show various setup on the layout such as: Furniture Equipment and Shop Outfit Computer Installations Fire and Safety Apparatus Location of Measuring Instruments and study the Placement Locate Lab Assistant Cabin Locate power supply arrangement	Electronics Laboratory Layout
Introduce with various lab / workshop equipment	List various equipment, tools List various registers List various furniture List various raw materials in lab List the name of various electronic material	Electronics Laboratory tools, equipment and materials
Introduce Lab Power Supply	Locate laboratory power supply (DC) Locate laboratory power supply 3 Phase AC Locate earthing Demonstrate good earthing using test lamp	AC DC Power supply Single Line Wiring Diagram

	Locate safety switchgears such as DP, TP, MCB, LCB, ELCB, Fuse etc. Demonstrate safety switchgears such as DP, TP, MCB, LCB, ELCB, Fuse etc. Demonstrate AC, DC power supply in the Lab Measure various supply voltages Draw a single Line Electrical Wiring Diagram of the workshop Show various points in the wiring diagram	
Introduce Safety Activities	Introduce workshop safety practice a. Electrical safety b. Handling safety Introduce safety rules in the workshop Introduce fire safety measures in workshop Introduce electrical safety measures Introduce first aid measures Demonstrate first aid	Electrical Safety Fire Safety First Aid

UNIT CODE TITLE	**ET-102: Basic Electricity**	
UNIT DESCRIPTOR		
DURATION	40 Hrs (Theory & Demonstration: 20 Hrs, Practical Hands on: 20 Hrs)	
LEARNING OUTCOME	**PERFORMANCE CRITERIA**	**RELEVANT KNOWLEDGE**
Introduce with Electricity	Explain the concept of electricity and its importance List the sources of electricity Explain how electricity is generated	Electricity Origin of electricity Important of electricity Generation of electricity
Basic electrical quantity	List out and name the basic units of electrical quantity Identify and draw the symbols for each electrical quantity Define the various electrical quantity such as: Voltage Current Power Resistance	Basic units, SI units Basic electrical quantity – current, voltage, resistance, load, energy power, work Definition, symbols, units, measuring instruments and use of basic electrical quantities

	Capacitance Inductance Introduce concept of Voltage and Current measurement by voltmeter and ammeter List out the importance and use of various electrical quantity List out and name the measuring instruments required to measure the various electrical quantity Introduce Household / Industrial Electricity Ratings	
Introduce basic laws and application	Name the basic laws Define the ohms laws and Kirchhoff current law Sense voltage and current Using Galvanometer Connect meter for reading the voltage / current in the circuit Connect a simple DC series circuit with Resistor, Power supply and voltmeter / ammeter arrangement Verify the ohms law and interpret the result Connect a simple parallel DC circuit with Resistor, Power supply and voltmeter / ammeter arrangement Verify Kirchhoff's Current law and interpret the result Verify Kirchhoff's Voltage law and interpret the result Calculate the power consumed on various load Interrelate Ohms Law with Current, Voltage, Resistance, Power and Energy Tabulate the Results Conclude the relationship between electrical quantities	Basic laws – definitions of ohms law, Kirchhoff current law and Kirchhoff voltage law Ohms law and its application

UNIT CODE & TITLE	**ET-103: Basic Electronics**	
UNIT DESCRIPTOR		
DURATION	40 Hrs (Theory & Demonstration: 20 Hrs, Practical Hands on: 20 Hrs)	
LEARNING OUTCOME	**PERFORMANCE CRITERIA**	**RELEVANT KNOWLEDGE**
Introduce with atomic structure	Explain the concept of atom, proton, neutron and electrons Introduce atomic structure with revolving	Atomic structure, proton, neutron and electrons

	electrons	
Introduce with +ve charge and –ve charge	Concept of free electrons Explain flow of electric current	Free electrons Valance Electron Flow of current through conductor and insulator
Introduce with impurities	Introduce Doping Study the concept of impurities for formation of semi-conductors	Intrinsic and extrinsic semi conductors Semi conductor materials (Silicon / Germanium and impurity addition) Flow of current through semi- conductor.
Introduce with P-N Junction	Explain P-N Junction formation. P-N Junction diode Symbols of electronic component Forward and reverse bias characteristics Concept of leakage current Heating of P-N Junction and heat sinks	P-N Junction formation. P-N Junction diode Identification of electronic component Leakage current Heat sink

UNIT CODE & TITLE	**ET-104: Electrical and Electronics Measurements**	
UNIT DESCRIPTOR		
DURATION	40 Hrs (Theory & Demonstration: 20 Hrs, Practical Hands on: 20 Hrs)	
LEARNING OUTCOME	**PERFORMANCE CRITERIA**	**RELEVANT KNOWLEDGE**
Introduce with Electrical measuring instruments	Explain concept of Electrical measuring instruments such as: Ammeter, Voltmeter, Multimeter, Galvanometer, LCR meter Selection of range and type of supply (AC, DC) for measuring instruments Measure quantity of electric current, voltage, resistance, capacitance, inductance by using analog / digital meters Demonstrate measurement of power and energy	Difference between AC and DC polarity. Range of measuring instruments. Reading of electric current, voltage, resistance by using analog / digital meters
Measurement of Electrical Quantity	Application of clamp meter for electrical measurements Application of multi meter for various electrical quantities Measurements of earth resistance Verify proper earthing for a given electrical / Electronic set up	Use of Ammeter, Voltmeter, Multimeter, Clamp meter, Megger, etc. Earth Testing
Introduce with CRO	Introduce Cathode Ray Oscilloscope (CRO) State classification of CRO such as Analog and Digital Introduce CRO front and back panels	Operating of Oscilloscope Reading of wave form AC / DC frequency on Oscilloscope

	Name functions of various controls Introduce CRO Probes and attenuator Introduce and demonstrate horizontal controls of CRO Introduce and demonstrate vertical controls of CRO Introduce trigger controls of CRO Introduce storage controls of CRO Introduce Function Generator Name various controls of Function Generator and name the function of each control Demonstrate connections of Function Generator to CRO Demonstrate various signals on CRO display Measure various parameters of the signals such as voltage, frequency, amplitude, DC level etc.	

Competency Based Curriculum for NSQF Level 2 (Class 10)
Sector: Electronics, Job Role: Electronics Technician, Electronics Component Tester, Digital Electronics Laboratory Attendant, Storage Battery Technician, Soldering Technician

Objectives:

Upon completion of this course, students will be able to:

- To provide an overview of the Fundamentals of Analog and Digital Electronics, Electronic Power Supplies, Storage Battery and Soldering of Electronic circuits.
- To provide the knowledge of active components construction and its working.
- To provide the knowledge of digital fundamentals and its application.
- To provide the concept of power supply and its uses.
- To provide the concept of soldering techniques.

Course Structure: This course (vocational qualification package) is a planned sequence of instructions consisting of the following 05 modules, called as Units.

Sn	Unit Code	Unit Title	Theory	Practical	Total
1	ET-201	Basic Electronics (Advanced)	20	25	45
2	ET-202	Applied Electronics	15	10	25
3	ET-203	Digital Electronics (Elementary)	20	20	40
4	ET-204	Power Supply	20	20	40
5	ET-205	Soldering Techniques	25	25	50
		Total Hours			**200**

RELEVANT SKILLS (Generic)

- Reading skill
- Writing skill
- Communication skill
- Language skill
- Behavioral skill
- Observation
- Listing skill
- Handling tools

Teaching and Training Methods: Theory with Demonstration and Practical Hands on

Location for Training: Classroom and Practical Laboratory

UNIT CODE & TITLE	**ET-201: Basic Electronics (Advanced)**	
UNIT DESCRIPTOR		
DURATION	45 Hrs (Theory & Demonstration: 20 Hrs, Practical Hands on: 25 Hrs)	
LEARNING OUTCOME	**PERFORMANCE CRITERIA**	**RELEVANT KNOWLEDGE**
Introduce P-N Junction diode	Identify diode terminals Read diode ratings Test diode using multi-meter Bias P-N Junction diode Perform and verifyForward and reverse biasing Plot VI characteristics in Forward and reverse bias Identify pick inverse voltage	P-N Junction diode Forward and reverse biasing Characteristics of diode
Identify different types of diode	For a Zener diode: Identify diode terminals Read diode ratings Testdiode using multi-meter Bias P-N Junction diode Perform and verify forward and reverse biasing Plot VI characteristics in Forward and reverse bias Identify Break down voltage Identify Zener diode as a voltage regulator diode Calculate voltage regulation	Zener diode Zener characteristics Zener as a voltage regulator
Introduce Bipolar Junction Transistor	Identification of P-N-P and N-P-N BJT Identify terminals of BJT Test BJT using multi-meter Mount BJT on bread board Bias BJT in CE, CB and CC configuration	P-N-P and N-P-N transistor configurations BJT construction and working principal Function of base, emitter and collector terminal. Testing of BJT Biasing concept
Introduce with JFET	Identify JFET by visual inspection Understand construction of JFET Draw the symbol of JFET Describe JFET List types of JFET Understand working principle of JFET Connect JFET in simple circuit	JFET Symbol/ circuit diagram, characteristics, types, working, application and advantages

UNIT CODE & TITLE	**ET-202: Applied Electronics**	
UNIT DESCRIPTOR		
DURATION	25 Hrs (Theory & Demonstration: 15 Hrs, Practical Hands on: 10 Hrs)	
LEARNING OUTCOME	**PERFORMANCE CRITERIA**	**RELEVANT KNOWLEDGE**
Introduce with AC to DC power supply	Introduce AC to DC conversion Apply diode as a rectifier Introduce filter circuits	AC and DC form of electricity Diode as a rectifier Application of filter circuits
Introduce Transistor as an amplifier	Introduce and demonstrate Single stage CE amplifier using BJT See, measure and plot waveforms of input and output Introduce and demonstrate RC coupled amplifier, plot input and output waveforms Apply CE configuration with feedback as an Oscillator	Transistor as a amplifier Building single stage amplifier Multistage Amplifier Coupling Introduction to Oscillator circuits
Introduce Power Amplifier	Introduce Power Amplifier such as Class A, Class B and Class AB Demonstrate a speaker output State applications in consumer electronics	Power Amplifier

UNIT CODE & TITLE	**ET-203: Digital Electronics (Elementary)**	
UNIT DESCRIPTOR		
DURATION	40 Hrs (Theory & Demonstration: 20 Hrs, Practical Hands on: 20 Hrs)	
LEARNING OUTCOME	**PERFORMANCE CRITERIA**	**RELEVANT KNOWLEDGE**
Introduce number systems	Introduce Binary, Decimal and Hexadecimal number system Convert number systems such as: Binary to Decimal, Decimal to Binary, Binary to Hexadecimal Hexadecimal to Binary	Familiarization of Numbering Systems Conversion of numbering Systems
Introduce with digital logic gates	Introduce Basic gates such as a OR, AND, NOR, NAND, EXOR, EXNOR etc. Using IC type Draw symbols of Logic gates Verify Truth table of Logic gates Construct basic gates using universal IC (NAND or NOR)	Logic Families Awareness of logic symbols of various gates Awareness of various types of logic ICs and its pin configurations
Introduce with Boolean Algebra	Testing different types of Logic Families and note down their pin configurations of various logic families	Awareness of input output of logic gates Handling of logic gates

	Simplify Boolean expression using Boolean Algebra	Boolean algebra
Logic Families	Perform demonstration on Test and Handling TTL logic family ICs	Test and Handling TTL logic family ICs Logic Families – Significance and Types, Characteristic Parameters Transistor Transistor Logic (TTL) , Guidelines to Using TTL Devices Guidelines to Handling and Using CMOS Devices Classification of Digital ICs
Characteristics of TTL Gates	Perform demonstration on Operation & Verification of various Characteristics of TTL Gates such as • Low State Input Current • High State Input Current • Low State Output Voltage • High State Output Voltage • Input-Output transfer characteristics	Study of various Characteristics of TTL Gates such as : • Low State Input Current • High State Input Current • Low State Output Voltage • High State Output Voltage • Input-Output transfer characteristics
Logic Gates	Perform demonstrations on operation & verification of Logic Gates such as AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR Gates. • Study of logic gates (AND, OR, NOT, NAND, NOR, XNOR). And verify truth table. • To verify the truth table of XOR and XNOR by AOI logic. • To verify operation of NAND and NOR gates as universal gates. • Verify 4 variables K-map.	Study of Logic Gates by Perfect Induction Method, such as AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR Gates.
Boolean algebra	Perform demonstrations on operation & verification of various theorems by Perfect Induction Method, such as: • Boolean algebra Theorems I to XVIII. • De - Morgan's Theorems I & II	Study of various theorems by Perfect Induction Method, such as : • Boolean Algebra • De - Morgan's Theorems

UNIT CODE & TITLE	ET-204: Power Supply	
UNIT DESCRIPTOR		
DURATION	40 Hrs (Theory & Demonstration: 20 Hrs, Practical Hands on: 20 Hrs)	
LEARNING OUTCOME	PERFORMANCE CRITERIA	RELEVANT KNOWLEDGE
Introduce Power Supply	Introduce AC power supply (Single and Three Phase 4 wire) Connect and disconnect AC power supply in the laboratory	AC Power Supply DC Power supply Filters Regulators
Introduce Transformer	Introduce single phase Transformer and its construction Define Primary and Secondary Turns and Voltages State the relationship between Voltage and Turns ratio Introduce Isolation Transformer Draw a symbol and Show Primary and Secondary Windings Introduce Operating Principle of Transformer Introduce Step-up and Step-down Transformer Introduce Transformer Ratings State various applications of a Transformer	Transformers Mutually induced EMF
Rectifiers	Introduce to the half wave rectifier Introduce to the full wave rectifier Introduce to the bridge rectifier Perform application of filter to half wave, full wave, bridge circuits Plot graphs to compare application of filter for smoothing of wave form	Types of Rectifications Awareness of graph for half wave, full wave and bridge rectifierSmoothing of DCAwareness of pulsating DC
DC Power Supply Regulator	Introduce to the Voltage Regulators using IC (7812, 7912) Connect Rectifier circuit to a combination of 7812 and 7912 Construct the regulated power supply Connect load resistance Calculate Voltage Regulation Plot Regulation characteristic	+12v, -12v Voltage Regulator and Voltage Regulation at various loads
Introduce Storage Batteries	Identify different types of Batteries Introduce Precautions while working with a battery Test Battery terminals for polarity Clean battery poles	Storage led acid battery

	Replace damaged battery poles State specification of Batteries Perform charging and discharging of Batteries Test specific gravity with hydrometer Replace battery solution and use distilled water for battery maintenance	

UNIT CODE & TITLE	**ET-205: Soldering Techniques**	
UNIT DESCRIPTOR		
DURATION	50 Hrs (Theory & Demonstration: 25 Hrs, Practical Hands on: 25 Hrs)	
LEARNING OUTCOME	**PERFORMANCE CRITERIA**	**RELEVANT KNOWLEDGE**
Introduce with Soldering Techniques	Perform Inspection of solder board Demonstrate and practice Soldering practice with soldering iron (25W) Select solder gun with tip Practice Use of Flux	Introduction of Soldering Working of Soldering iron and soldering gun Use of Flux
Introduce with Soldering material	Inspect soldering joints Introduce and test Dry solder Inspect Good and bad joints Study Ratio of lead and tin	Dry solder Good and bad joints Ratio of lead and tin
Introduce with practice of soldering with various watts of soldering iron	Practice Soldering of components with various soldering iron (watts)	Various soldering iron (watts)
Introduce with de-soldering	Introduce De-soldering concept Practice De-soldering using vacuum pump Practice De-soldering using de-soldering Vicks Introduce precautions while de-soldering	Use of De-solder pump / Dissolve wig
Introduce with soldering station	Introduce Operation of soldering station Perform Setting of Temperature controls Perform Setting of air controls Practice Setting of various nozzles for soldering and de-soldering Practice removing SMD components from PCB	Operating and applications of soldering station