

Upgradation of ITIs into Centers of Excellence-Broad guidelines for implementation of the scheme For sector “Electronics”

These Centres will be providing multi skill training to meet the skill requirement of particular sector of industry with their active involvement in all aspects of training. The training will be provided in three parts as given below:

- ✓ Training in Basic skill areas for a period of one year.
- ✓ Training in Advanced modules for next six months.
The testing & certification for the Basic skill training during first year & also for advanced training during next six months will be conducted by NCVT
- ✓ Training in specialized modules mainly in the industry (The course curricula, duration etc will be designed in consultations with the IMC/local industry. The trade testing & certification for this component will be done jointly by the State Government & Industry. Said certificate will be recognized by NCVT

As per the recommendations of the EFC, Training in the shop floor should constitute atleast 25-40% of the curriculum.

The training programme will have multi-entry and multi-exit provisions:

- ✓ trainee can opt to go to the labour market after completing broad based basic training of one year duration as well as after completing 1½ year of training.
- ✓ trainee can come back after some time to seek admission for advanced/specialised training in another module
- ✓ ITI pass out trainee of the particular trade(s) from the conventional system can seek admission for advanced/specialised training

As per the approved curricula in the Area/Sector of “**Industrial Sector Electronics**”, uniform rotation of trainees in six modules each of eight weeks duration as mentioned below is envisaged to be taken up. The trades from where

existing infrastructure i.e. equipment/ instructor etc. could be utilized for the training in '**Electronics**' sector and space requirement of each module is as under: -

Basic Module	NAME OF THE MODULE	Trade(s) from where existing equipment/instructor could be utilised	Space Requirement (Sqm)
EBT - 01	BASIC FITTING AND SOLDERING	*Fitter/ *Carpentry/*Sheet Metal/Electronics Mechanic/R&TV	80
EBT – 02	** BASIC ELECTRICAL & ELECTRONICS	Electrician/Electronics Mechanic/R&TV	60
EBT – 03	** BASIC ANALOG ELECTRONICS	Electronics Mechanic/R&TV	60
EBT – 04	** BASIC DIGITAL ELECTRONICS	Electronics Mechanic/R&TV	60
EBT – 05	** BASIC MEASURING INSTRUMENTS	Electronics Mechanic/R&TV/Instrument Mechanic	60
EBT – 06	BASIC COMPUTERS	COPA/IT&ESM	60

* Facilities available in ITIs may be utilized for imparting skill training. Where such trades are not in operation , facilities available in the near by ITI be utilized .

** Elementary topics relating to individual module if need be taught before starting the module .

For these modules, Trade Practical will be 28 hours /week and Trade theory for 4 hours /week. Apart from above Generic modules as mentioned below will be taught throughout the year.

EBT-07- WORKSHOP CALCULATION & SCIENCE.....2 hrs/week

EBT-08-ENGINEERING DRAWING2 hrs/week

G-01-ENTERPRENEURSHIP AND COMMUNICATION SKILLS...2 hrs/week

In addition, 4 hours/week have been kept for Library studies & Physical Training

Vocational Instructors:

NAME OF THE MODULE	No. of Vocational Instructors (VIs)
ECBT – 01 to 06	Six VIs one each for 6 module of relevant trades
ECBT-07 & ECBT - 08	One VI having Diploma in relevant field
G-01	One contract/part time / guest faculty for Generic module, ENTREPRENEURSHIP AND COMMUNICATION SKILLS –G-01

The eligibility and other criteria will be as follows:

Eligibility : **10th pass under 10+2 system with Science as one of the subject**

Batch size : **96 trainees 16 in each module (20% supernumeraries be allowed to take care of drop outs as already exist under CTS)**

Admission:

For basic training, admissions are to be made in August / Feb each year.

Fee Structure:

Fee Structure may be decided by States Govt. in consultation with IMCs . It may be desirable to prescribe a uniform tuition fee for a sector in all Centres of Excellence of a state.

Space: Since workshop/theory class rooms are envisaged to be accommodated in the existing building of the ITI, therefore, following norms are prescribed only for new infrastructure is to be created .

- (1) Workshop space of 60 sqm for each basic module (except for EBT-1 where space required is 80 Sqm)
- (2) Three Theory classrooms of 30 sqm each)
(since workshop/theory class rooms are envisaged to be accommodated in the existing building of the ITI, some flexibility i.e. from 55 - 60 sqm area for workshop and 20-30 sqm area for class room area is proposed to be provided)

The Theory classrooms should have latest infrastructure including AV aids as per details given below:

- | | | |
|----|---|---------------|
| 1. | Suitable Chairs/ tables* | - As required |
| 2. | OHP/Epidiascope | - 1 No. |
| 3. | Laptop computer/PC (latest) & LCD projector** | - 1 No. |
| 4. | Magnetic white board | - 1 No. |
| 5. | White board | - 1 No. |
| 6. | Flip chart | - 1 No. |
| 7. | Storage Almirah | - As required |

(* Optimum utilization of space/flexibility may be kept in view)

(**Keeping in view the constraints of funds under the scheme, it is proposed to procure only one set of Laptop computer/PC / LCD projector for CoE. However, States may procure additional Laptop computer/PC/LCD projector from their funds) While selecting furniture, it should be kept in mind that these are meant for Centres of Excellence. Criteria like maximum flexibility/utilization of space should be kept in view.

Office Equipment:

For each CoE one Scanner, one Photocopy Machine and one PC/printer along with suitable accessories/furniture and internet connection (if not already available in the institute) is proposed to be provided for each CoE, in addition to the equipment prescribed in the syllabus.

Addition/alteration/Construction:

For Civil Works, tentative amount of Rs 40.00 lakhs have been proposed per CoE. It is envisaged to have separate block/ wing for the Centres of Excellence in the ITI campus. In case space is available in the existing building of an ITI for taking up new areas as per requirement of the cluster of Industry, the existing space will be renovated as per the need. Alternately, separate block will be built up in the same campus keeping in view the space requirements of the Electrical Sector.

While planning for addition /alteration/Construction of workshop and Class rooms, following may be kept in view:

- ✓ concept of a Centre of Excellence
- ✓ the fact that the requirement of funds for construction /addition /alteration for advanced training will be higher than that of basic training

Publicity

Wide publicity & advertisement be given for better response . The role of the local as well as the concerned Industry is very vital for the success of this program.

States may consider providing additional equipment/ other facilities like separate Library/upgradation of existing Library, Conference Hall/ Committee Room etc. from their own funds.

I N D E X

UPGRADATION OF ITIs INTO CENTERS OF EXCELLENCE (CoE)

SECTOR / AREA: ELECTRONICS

BROAD BASED BASIC TRAINING

(ONE YEAR)

MODULE NO.	NAME OF THE MODULE	DURATION IN WEEKS
EBT - 01	BASIC FITTING AND SOLDERING	8 weeks
EBT – 02	BASIC ELECTRICAL AND ELECTRONICS	- do -
EBT – 03	BASIC ANALOG ELECTRONICS	- do -
EBT – 04	BASIC DIGITAL ELECTRONICS	- do -
EBT – 05	BASIC MEASURING INSTRUMENTS	- do -
EBT – 06	BASIC COMPUTERS	- do -

EBT – 07	WORKSHOP CALCULATION & SCIENCE	@ 2 hrs / week 48 weeks
EBT – 08	ENGINEERING DRAWING	- do -
G - 01	ENTREPRENEURSHIP AND COMMUNICATION SKILLS (given separately)	- do -

UPGRADATION OF ITIs into CENTERS of
EXCELLENCE (CoE)

SECTOR / AREA : ELECTRONICS

**BROAD BASED BASIC TRAINING
(ONE YEAR)**

**MODULE - EBT - 01 : BASIC FITTING AND SOLDERING
(Duration - 8 weeks)**

BROAD BASED BASIC TRAINING

(One Year)

MODULE – EBT - 01: BASIC FITTING AND SOLDERING

(Duration - 8 weeks)

I) COURSE CONTENT

Practical	Theory
<p>Safety precaution and elementary & First aid</p> <p>Familiarise with the tools ,Filing practice on marking, hack sawing, filing to size.</p> <p>Drilling practice, fitting exercises on various shapes, Tapping and Chipping</p> <p>Practice on cutting, planing and making different joints</p>	<p>Fitting and Wood work : Safety precautions and elementary</p> <p>First aid ,Introduction of Fitting Trade, familiarise with various Hand tools used in fitter workshop and their general uses. Methods of measuring and marking. Description of files, hammers , chisels, hacksaw frames, blades-their specifications and uses. Different Metals and alloys- their characteristics and uses, Types of drills, description and working of machines, use of Vernier calipers, Micrometer, height gauge etc., use of tap & dies, various types of threads and their specific applications, different types of nuts & bolts.</p> <p>Common hand tools used in carpentry workshop, marking, cutting and planing. Types of woods & their uses, Types of joints.</p>
<p>Practice on shearing, bending and making various joints.</p> <p>Making rectangular boxes. Riveting exercises.</p> <p>Selection of wires and cables.</p> <p>Simple wiring practice,</p> <p>Exercises on wire joints and crimping</p> <p>Simple exercise on Tinning, soldering etc</p>	<p>Sheet Metal ,Wiring & Soldering: Familiarise with different hand tools used in sheet metal workshop , various types of joints used in sheet metal, Rivet and its types and uses. Making of rectangular box.</p> <p>Wires and cables : specification , selection & used in electrical wiring ,connectors, lugs, various types of wire joints, crimping ,protective devices and their uses, SWG.</p> <p>Soldering : various composition of solder wires, fluxes and their uses.</p> <p>Characteristics ,properties and uses of : Bakelite, PVC, Porcelaine etc</p>

II) TOOLS, MACHINERY, EQUIPMENT etc. for a batch of 16 TRAINEES

Category	Sl no	Name of Tool & Equipment	Quantity
Hand tools	1	Rule steel 15 Cm (metric graduations)	17
	2	Square try 10 Cm blade	17
	3	Caliper outside 15 Cm spring	17
	4	Caliper in side 15 Cm spring	17
	5	Divider spring	17
	6	Scriber	17
	7	Punch center	17
	8	Screw Driver	17
	9	Chisel cold	17
	10	Hammer ball pin .45 Kg with handle	17
	11	Hammer ball pin .22 Kg	17
	12	File flat 25 Cm 2 nd cut	17
	13	File Flat 25 smooth	17
	14	File half round 2nd cut 15 Cm	17
	15	Hacksaw frame adjustable 20-30 Cm	17
	16	Safety goggles	17
	17	Dot slot punch	17
	18	Pincer	17
	19	Electrical double bladed knife	17
	20	Cross pin hammer 115 gms with handle	17
	21	Neon tester	17
	22	Heavy duty Screw driver 200 mm	17
	23	Gimlet 6mm	17
	24	18" Hand saw	17
	25	9" Smooth Plainer	17
	26	18' Jack Plainer	17
	27	Marking gauge 6"	17
	28	Carborandum stone	17
	29	Dow tail saw	17
	30	9 mm Mortice Chisel	17
	31	6 mm Mortice Chisel	17
	32	Triangular File 4 "	17
	33	½" Dow tail Chisel	17

Category	Sl No	Name of Tool & Equipment	Quantity
Instruments and General Shop Out fit per unit	1	Rule Steel 30 Cm (Metric)	
	2	Rule steel 60 Cm	4
	3	Straight edge 45 Cm steel	4
	4	Flat surface 45 x 45 Cm	4
	5	Marking table 90x 90x 90 Cm	4
	6	Universal scribing block 22 Cm	4
	7	Block V pair 7 Cm and 15 Cm with clamp	4
	8	Square adjustable blade 15 Cm	4
	9	Angle plate 10x20 Cm	4
	10	Sprit level metal 15 Cm	4
	11	Punch Letter 3 mm Set	4
	12	Punch number 3 mm set	4
	13	Portable hand drill (electric) 0-6 MM	3
	14	Drill brace hand 0-12 MM	4
	15	Drill twist S/S 1.5 to 12 MM by 0.4 MM	4
	16	Taps & dies complete set American	4
Instruments and General Shop Out fit per unit	17	Taps & dies complete set Metric	4
	18	File warding 15 Cm smooth	4
	19	File knife edge 15 Cm smooth	4
	20	File cut saw 15 m smooth	4
	21	File feather edge 15 Cm smooth	4
	22	File triangular 15 Cm smooth	4
	23	File round 20 Cm 2 nd cut	4
	24	File square 15 Cm 2 nd cut	4
	25	File square 25 Cm 2 nd cut	4
	26	Filler gauge 10 blades	4
	27	File flat 30 Cm 2 nd cut	4
	28	File flat 30 Cm bastered	4
	29	File swiss niddle type set of 12	4
	30	File half round 25 Cm 2 nd cut	4
	31	File half round 25 Cm bastered	4
	32	File hand 15 Cm	4
	33	Card file	4
	34	Spanner whit worth DE 6 mm to 25 MM set	4
	35	Spanner adjustable 15 Cm	4
	36	Scraper flat 15 cm	4
	37	Scarper 3 corner 15 Cm	4
	38	Plier combination 15 Cm	4
	39	Chisel cold & cross cut 9 mm	4
	40	Chisel cold 19 mm flat	4
	41	Chisel 9 mm round nose	4
	42	Clamp "C" Cm & 10 Cm	4
	43	Micrometer 0-2.5 Cm outside	4
	44	Micrometer 25-50 mm outside	4
	45	Micrometer 0-25 mm outside	4

Instruments and General Shop Out fit per unit	46	Micrometer 50-75 mm outside	4
	47	Micrometer 25-50 mm inside with extension rod	4
	48	Vernier caliper 20 Cm	4
	49	Vernier Height gauge 30 Cm	4
	50	Vernier bevel protector	4
	51	Screw pitch gauge	4
	52	wire gauge metric standard	4
	53	Drill chuck 12 mm	4
	54	Pipe wrench 40 Cm	4
	55	Vice bench jaw type 12 Cm 10	4
	56	Prick punch	4
	57	Mallet	4
	58	Snip straight	4
	59	Setting hammer with handle	4
	60	Planishing hammer	4
	61	Snip bent 25 cm	4
	62	Gauge imperial sheet	4
	63	Allen key set	4
	64	Rawl plug tool & bit	4
	65	Megger 0-1000M ohm & 2.5 to 5k V	4
	66	Soldering Iron 25 w, 35W, 65 W, 125 W	4
	67	Wire Stripper 20 Cm	4
	68	Country Drill 18"	4
	69	24 " Jack Plainer	2
	70	Carpenter vice 10 "	16

III) OTHER REQUIREMENTS

a) WORKSHOP AREA 80 Sqm

b) LAB FURNITURE

Category	SI No.	Name of Tool & Equipment	Quantity	Remarks
Furniture	1	WORK BENCH / TABLE / TEST BENCH	As required	Fitter & Carpentry
	2	REVOLVING CHAIR / STOOL [FOR PARTICIPANTS]	16	
	3	STAFF TABLE	1	
	4	REVOLVING CHAIR [FOR STAFF]	1	
	5	STEEL RACKS	As required	
	6	STEEL ALMIRAH	As required	
	7	STEEL LOCKERS FOR 16 PARTICIPANTS	As required	
	8	FIRE EXTINGUISHER	As required	

UPGRADATION OF ITIs into CENTERS of
EXCELLENCE (CoE)

SECTOR / AREA: ELECTRONICS

BROAD BASED BASIC TRAINING
(One Year)

**MODULE – EBT - 02: BASIC ELECTRICAL AND
ELECTRONICS**
(Duration - 8 weeks)

BROAD BASED BASIC TRAINING

(One Year)

MODULE – EBT - 02: BASIC ELECTRICAL AND ELECTRONICS

(Duration - 8 weeks)

I) COURSE CONTENT

Practical	Theory
Identification of various Hand tools used Identification of different types of cables, SWG practice.	Safety precautions and elementary First aid, Identification, uses and maintenance of hand tools, DC & AC current, terms and definitions used in circuits , frequency, waveform
Measure the power , power factor and energy in different circuits. Construct & verify Ohm's law. Construct and verify Kirchoff's voltage law. Tracing the magnetic field of Bar magnet using compass.	Measurement of AC & DC using Ammeter / Voltmeter , AC power, power factor, work, power & Energy - their units and measurements , Identification of AC / DC meters, Kirchoff's law, Ohms law, electric power and dissipation in resistance, IR voltage drops. Define magnetism, unit of measurement, types of magnetic properties, Magnet and its classification, materials used & its application, mutual & self inductance, unit of measurement, BH curve .
Identification of different resistors i.e. carbon, wire-wound, variable, pot., preset, Rheostat etc. Color-coding of resistors ,Construct a series & parallel resistor circuits Identification of capacitor and their codes, construct the series /parallel circuit of capacitor Identification of inductor , construct the series /parallel circuit of inductor. Identification of capacitor and their codes, construct the series /parallel circuit of capacitor	Passive Components : Resistor -definition, types of resistors, their construction & specific use, color-coding, power rating,. Series /parallel combination of resistances and measurement of current in branches. Capacitance – define, construction, types of capacitors, color coding charge/energy stored in capacitor, capacitive reactance, series/ parallel combination of capacitors Inductors-define ,types & their application, series and parallel combination, Q factor, Current carrying conductor, Fleming rule Electromagnets –define, Solenoids & relays define ,construction & its application.

Construct an electromagnet and test it.	Working principle , construction of Transformers & their types, various losses of transformers.
Testing and construction of different types relays.	RC,RL, RLC Circuits, Series and parallel resonance
Identification and testing of different types of transformers, measure the O/P voltage.	
Identification of anode, cathodes of different types of diodes. Study the specifications of a semiconductor diode using a data sheet Construct a forward bias and a reverse bias circuit and plot V-I characteristic of diode	Electrons and protons in an atom, Structure of atom, valance & conduction electron, Conductors, Insulators, Semiconductors, charge in motion-current, units, electron flow, motion of +ve charge, Semiconductors, Crystal structure and bonds, Intrinsic & extrinsic semiconductors, N- type, P-type, Free electron & Hole charges, Fixed ion charges, The P-N junction, Barrier potential, Forward & Reverse voltage, Effect of temp., V-I characteristic, Special purpose diodes and symbols.
Construct a half wave rectifier, full wave (center tapped) rectifier and full wave (Bridge) rectifier. Observe wave forms with/ without using filter. Study the specifications of zener diode using data sheet. Construct the Zener regulator circuit	Rectifier types i.e. Half-wave, full-wave & bridge rectifiers, measurement of different currents i.e. I_m , I_{dc} , I_{rms} , d.c. out put voltage, efficiency, filter circuits and their types, i.e. capacitor input filter, Choke input filter, etc, Junction break down, Zener break down, Zener diode, Forward & Reverse bias, Voltage regulation using Zener diode ,Zener regulators,
Series parallel combination of batteries Charging of batteries, maintenance of batteries Calculate the shorted load and matched load current for given cell	Battery: Electrochemical action, define symbol, types of cell, construction, principle charging ,specific gravity (Amp-hr capacity) specification of battery classification of battery, application, , service needs, storage, , lead acid battery ,. ideal voltage source, real voltage source, shorted load current, matched load current, Current source.

II) TOOLS, MACHINERY, EQUIPMENT etc. for a batch of 16 TRAINEES

Category	Sl No	Name of Tool & Equipment	Quantity
Hand tools	1	Rule wooden 4 fold	17
	2	Scriber	17
	3	Pincer insulated Screw Driver Knife double bladed electrician	17
	4	Insulated handle thin connector screw driver	17
	5	Tester	17
	6	Heavy duty screw driver	17
	7	Combination plier	17
	8	Long nose plier Tweezer	17
	9	Heat sink plier	17
	10	Watch maker screw driver	17
	11	Adjustable spanner /slide wrench	17

Category	Sl No	Name of Tool & Equipment	Quantity
Instruments and general shop out fit per unit	1	Wire stripper	4
	2	Soldering iron	4
	3	Wire gauge set	4
	4	Feeler gauge	4
	5	Permanent magnet bar	8
	6	Solenoid with core	8
	7	Electric bell	8
	8	Battery storage lead acid/Maintenance free	8
	9	Hydrometer	4
	10	Battery charger	4
	11	Rheostat variable values	8
	12	Variable resistance /potentiometer	4
	13	Transformer 500 VA	4
	14	DC& AC ammeter 0-50 uA	4
	15	DC& AC ammeter 0-500 uA	4
	16	DC& AC ammeter 0-1mA	4
	17	DC& AC ammeter 0-500 mA	4
	18	DC& AC ammeter 0-1 A	4
	19	Multimeter small & big	4 each
	20	Bread board for connecting various components i.e. diode, resistances ,capacitors etc,	8
	21	0-12 V DC ,2 Amp power supply	4
	22	Transformer 0-12 V, 6-0-6 V , 1 Amp	4
	23	Rubber gloves	8

III) OTHER REQUIREMENTS

a) LAB AREA

60 Sqm

b) LAB FURNITURE

Category	Sl no	Name of Tool & Equipment	Quantity
Furniture	1	WORK BENCH / TABLE / TEST BENCH	As required
	2	REVOLVING CHAIR / STOOL [FOR PARTICIPANTS]	16
	3	STAFF TABLE	1
	4	REVOLVING CHAIR [FOR STAFF]	1
	5	STEEL RACKS	As required
	6	STEEL ALMIRAH	As required
	7	STEEL LOCKERS FOR 16 PARTICIPANTS	As required
	8	Fire Extinguisher	As required
	9	Rubber mat	As required

UPGRADATION OF ITIs into CENTERS of
EXCELLENCE (CoE)

SECTOR / AREA: ELECTRONICS

BROAD BASED BASIC TRAINING
(One Year)

MODULE – EBT - 03 : BASIC ANALOG ELECTRONICS
(Duration - 8 weeks)

**BROAD BASED BASIC TRAINING
(One Year)**

MODULE – EBT - 03: BASIC ANALOG ELECTRONICS

(Duration - 8 weeks)

I) COURSE CONTENT

Practical	Theory
<p>Study the specification of different diodes using data sheet</p> <p>Using the data sheet identify the application of given transistor</p> <p>Check the transistor (resistance) using Multimeter, identify the NPN/PNP transistor</p>	<p>Safety precautions and elementary First aid</p> <p>Introduction to Semiconductors and review of P N junction diodes,</p> <p>Definition, types, construction, symbol, pin configuration, biasing, application, configuration of common emitter, common base, common collector transistor, their definition characteristics and application, different packages of transistors, out of circuit test, in-circuit test</p> <p>Transistor biasing circuits- types</p>
<p>Test a common emitter, common base amplifier</p> <p>Construct an emitter follower, RC coupled amplifier and plot the graph the chart.</p> <p>Test Darlington amplifier</p> <p>Identify the use of various types of heat sink based upon use</p>	<p>CE ,CB,CC amplifier ,circuit and their characteristics</p> <p>Alpha ,beta, voltage gain, Concept of dB ,dBm</p> <p>Darlington amplifier- circuit, & application</p> <p>Various Classification of amplifiers , RC Coupled amplifier, DC Amplifier , power amplifiers - circuit, operation, & application, transistor power rating & use of heat sink.</p>
<p>Construct and test the :Hartley , phase shift oscillator , multivibrator circuits</p>	<p>Feedback concepts , feedback connection types and their circuits, oscillator – definition, types, circuit and application (phase shift oscillator, wein bridge oscillator, colpitts oscillator, Hartley oscillator, crystal oscillator etc), multivibrator- definition, types, circuits and application.</p>

<p>Study the pin diagram of 741 IC</p> <p>Construct and test the Inverting & Non Inverting Amplifier</p> <p>Construct the comparator using OP-AMP</p>	<p>Introduction to Differential amplifier : construction & working Op-Amp: importance, characteristics mode gain, common-mode schematic diagram of 741, symbol, Non-inverting voltage amplifier, inverting voltage amplifier, , linear and non-linear applications of 741,Comparator using op-amp ,other popular op-amps</p>
<p>Construct a + ve /-ve regulator using 78XX & 79XX series IC</p> <p>Construct a regulator using op-amp.</p> <p>Draw layout of the SMPS power supply.</p> <p>Identify different sections of the SMPSpower supply & measure voltages at different testing points.</p>	<p>Regulated Power supply using transistor, ,78XX series, 79XX series, Op-amp regulator, 723 regulator , Block diagram of a S.M.P.S., Working principle, and its application (Transistorized & IC based) voltage regulation, error correction and amplification etc.</p>
<p>Construct and verify +ve, - ve biased clipper circuits and observe the wave form shapes.</p> <p>Construct and verify clamper circuit and observe wave form,</p> <p>Construct, test and plot the characteristics of FET, UJT, SCR, TRIAC, DIAC</p>	<p>Definition of pulse amplitude ,duration, repetetion,rise time,Step & Ramp Voltage</p> <p>Exponential voltage ,Clipping & Clamping circuits , their types and uses,</p> <p>Integrator & differentiator circuits and their applications</p> <p>Special devices: Construction ,working and application: FET,UJT,SCR,DIAC,TRIAC,MOSFET, Optocouplers,LDR,VDR,Thermistor,inf rared LEDs</p>
<p>Verify the different shapes with the help of CRO.</p>	<p>Block diagram, working and applications of : Sine wave generators, signal generators, pulse & square wave generator, audio frequency generators, Function generators</p>

II) TOOLS, MACHINERY, EQUIPMENT etc. for a batch of 16 TRAINEES

Category	Sl No	Name of Tool & Equipment	Quantity
Hand tool	1	Rule wooden 4 fold	17
	2	Scriber	17
	3	Pincer insulated Screw Driver Knife double bladed electrician	17
	4	Insulated handle thin connector screw driver	17
	5	Tester	17
	6	Tweezer	17
	7	Combination plier	17
	8	Long nose plier	17
	9	Heat sink plier	17
	10	Watch maker screw driver	17
	11	Adjustable spanner /slide wrench	17
	12	Soldering iron	17
	13	Digital Multimeter 3 ½ digit	17

Category	Sl No	Name of Tool & Equipment	Quantity
Instruments and general shop out fit per unit	1	Basic Electronics Trainer for conducting practical of LDR, Transistorized Amplifier and Oscillators with bread board facility for connecting components & DC regulated power supply for the experiment along with different passive components on board . Necessary current meters and Volt meters should also be provided	5
	2	Linear IC trainer for conducting practical of 741& 723 Op-AMP with bread board facility for connecting components & DC regulated power supply for the experiment along with different passive components on board . Necessary current meters and Volt meters should also be provided	5

	3	Power Electronic trainer for conducting practical of UJT, FET. SCR. DIAC, TRIAC, MOSFET, OPTO COUPLER with bread board facility for connecting components & DC regulated power supply for the experiment along with different passive components on board . Necessary current meters and Volt meters should also be provided	5
	4	SMPS trainer (IC & Transistorized based) with various test points for check the voltage and wave form having 4 O/P 110v,24V,12V,5 V	5
	5	Power supply trainer having facility of IC regulators using 78 & 79 series	5
	6	Bread board	8
	7	Oscilloscope 20 MHz with probes	4
Instruments and general shop out fit per unit	8	Oscilloscope 50MHz with probes	2
	9	Electronic Multimeter	8
	10	Function generators 0.1 Hz to 100KHz Sine Square,Triangular	5
	11	Pulse generator	5
	12	Sine wave generator	5
	13	Audio frequency generator	5
	14	Signal generator	5
	15	Digital Multimeter	5
	16	Magneto scope	2
	17	Soldering iron 25Watt	4
	18	1200 VA Inverter	1
	19	0-12 V DC regulated Power supply	4
	20	Auto Transformer	2

III) OTHER REQUIREMENTS

a) LAB AREA

60 Sqm

b) LAB FURNITURE

Category	Sl no	Name of Tool & Equipment	Quantity
Furniture	1	WORK BENCH / TABLE / TEST BENCH	As required
	2	REVOLVING CHAIR / STOOL [FOR PARTICIPANTS]	16
	3	STAFF TABLE	1
	4	REVOLVING CHAIR [FOR STAFF]	1
	5	STEEL RACKS	As required
	6	STEEL ALMIRAH	As required
	7	STEEL LOCKERS FOR 16 PARTICIPANTS	As required
	8	FIRE EXTIGUISER	As required
	9	RUBBER MAT	As required

UPGRADATION OF ITIs into CENTERS of
EXCELLENCE (CoE)

SECTOR / AREA: ELECTRONICS

BROAD BASED BASIC TRAINING
(One Year)

MODULE – EBT - 04: BASIC DIGITAL ELECTRONICS
(Duration - 8 weeks)

BROAD BASED BASIC TRAINING

(One Year)

MODULE – EBT - 04: BASIC DIGITAL ELECTRONICS

(Duration - 8 weeks)

I) COURSE CONTENT

Practical	Theory
Verify the truth table of AND, OR, INVERT, NAND, NOR, EX-OR, EX-NOR gates	Safety precautions and elementary First aid Introduction to Digital Electronics, Basic gates & Universal gates. Digital code: Excess 3 code, grey code, BCD code, ASCII code
Construct the circuit of Half adder & Full adder and verify the truth table, Construct the Adder cum Subtractor and verify the result. Verify the truth table of RS, D, JK Flip flop	Arithmetic circuits: 1's & 2's complement Half adder & Full adder, 4 bit adder Half & Full subtractor, Adder cum Subtractor. Flip-Flop: Basic RS Flip Flop, D Flip Flop, JK Flip Flop, T Flip Flop Clocked Flip Flop, Timing diagram
Construct the shift register using RS/D/JK flip flop and verify the result Construct the Asynchronous & Synchronous counter using D FF /JK Flip flop	Shift Register: Serial to parallel and vice versa, Parallel to parallel and serial to serial, Timing diagram, important applications Counters: Requirement of Flip Flops, MOD of counter Synchronous and Asynchronous counter Timing diagram, Specialised counter i.e Ring counter, Johnson counter
Construct the display circuit using the drivers and verify the result.	Display devices: Various display devices: LED, 7 segment, LCD, Display drivers, monitors, encoding & decoding
Study the Analog to Digital conversion process using a practical setup.	Analog to digital conversion using various methods Digital to Analog conversion Block diagram and working of DVM Logic families: Working of standard TTL & CMOS gates Concept of ECL, Schottky arrangement etc. Handling of CMOS Integrated circuits.

<p>Develop the film of designed circuit and etching the PCB</p> <p>Drilling of developed PCB</p>	<p>PCB Designing: access and exploring to component library, use of components from library, drawing of circuit and fixing of components, simulation of circuit, getting the PCB layout of designed circuit, manual/automatic operation, Development of PCB of circuits</p> <p>Design a circuit with the help of Software</p>
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II) TOOLS, MACHINERY, EQUIPMENT etc. for a batch of 16 TRAINEES

Category	SI No	Name of Tool & Equipment	Quantity
Instruments and general shop out fit per unit	1	Digital Electronics Trainer with board facility for conducting practical on TTL & CMOS ICs along with –necessary P/S, facility to provide 16 Logical I/P and display O/P , provision to provide Clock I/P 1Hz,100 Hz,1 KHz , 7 segment display along with drivers so that I/P may be connected to drivers to get O/P, current & Volt meters may also be provided	5
	2	Logic Analyzer	1
	3	Logic probe	1
	4	Logic clip	1
	5	5 V DC Power supply	8
	6	Bread board	8
	7	Oscilloscope 100 MHz with probes (1:1,1:10)	2
	8	Digital Multimeter	5
	9	Function generators 0.1 Hz to 100KHz Sine Square,Triangular	4
	10	Magneto scope	2
	11	Soldering iron 25Watt	8
	12	1200 VA Inverter	1
	13	Auto Transformer I/P 230/250V,O/P 0-270 V,5 Amp	2
	14	Computer system PIV with 40 GB HDD,CD Drive,31/2"FDD,256 MB RAM	5
Instruments and general shop out fit per unit	15	PCB Design software i.e circuit maker or equivalent	5
	16	Artwork film maker	2
	17	Thru hole plating system	2
	18	Dry film laminator	2
	19	Art work table	2
	20	Roller Tinning machine	2
	21	Photo resistive DIP coating Machine	2
	22	Etching Machine	2
	23	PCB curing Machine	2
	24	Double sided U-V exposure unit	2
	25	PCB shearing Machine	2
	26	PCB Drilling machine	2
	27	Soldering & Desoldering station	1
	28	Plotter	1

Category	SI No	Name of Tool & Equipment	Quantity
Hand tool	1	Wire Stripper	17
	2	Tester	17
	3	Double bladed electrician knife	17
	4	Tweezer	17
	5	Combination plier	17
	6	Watch maker screw driver	17
	7	Rubber Gloves	17
	8	Goggles	17

III) OTHER REQUIREMENTS

a) LAB AREA 60 sqm

b) LAB FURNITURE

Category	SI no	Name of Tool & Equipment	Quantity
Furniture	1	WORK BENCH / TABLE / TEST BENCH	As required
	2	COMPUTER TABLE WITH SUITABLE CHAIR	5
	3	5 00 VA UPS	5
	4	REVOLVING CHAIR / STOOL [FOR PARTICIPANTS]	16
	5	STAFF TABLE	1
	6	REVOLVING CHAIR [FOR STAFF]	1
	7	STEEL RACKS	
	8	STEEL ALMIRAH	As required
	9	STEEL LOCKERS FOR 16 PARTICIPANTS	As required
	10	FIRE EXTIGUISER	As required
	11	RUBBER MAT	As required

UPGRADATION OF ITIs into CENTERS of
EXCELLENCE (CoE)

SECTOR / AREA: ELECTRONICS

BROAD BASED BASIC TRAINING

(One Year)

MODULE – EBT - 05 : BASIC MEASURING INSTRUMENTS

(Duration - 8 weeks)

BROAD BASED BASIC TRAINING (One Year)

MODULE – EBT - 05: BASIC MEASURING INSTRUMENTS

(Duration - 8 weeks)

I) COURSE CONTENT

Theory	Practical
Verification of Faraday's law of electromagnetic induction. Verification of Lenz law Demonstration of Fleming's fingre rules	Safety precautions and elementary First aid Introduction to measurement basics: Accuracy, precision, errors and its types, calibrations etc., Faradays law of Electromagnetic induction, Lenz's law of hysteresis & eddy currents, Flemings rule, Introduction to various types of instrument
Study of Galvanometer Study of MI Voltmeter & Ammeter Study of Watt meter Study of 1-phase Energy meter	Different types of Galvanometers , construction & working of PMMC D'Arsonol Galvanometer, , Moving iron instruments, Principle & operation of Voltmeter, Ammeter, Errors in Ammeters & Voltmeters, Sensitivity, and their loading effect, Conversion of Galvanometer into voltmeter, extension of ranges ,Advantages & disadvantages of Moving coil & moving iron instruments Wattmeter, Energy meters
Study of Multi meter and measure the various parameter of a given circuit Study of VTVM	Different types of electronic voltmeters, Conventional Multimeter , VTVM,
Bridge type of instruments: Wheatstone bridge, resistance ratiom bridge,maxwell bridge, schering bridge ,LCR meter,	Set up the circuit on Whetstone bridge, Resistance ratio, Maxwell Bridge and Schering Bridge and measure the various parameter

Study the different function using Trainer Measure the Voltage, current and frequency	Oscilloscope: Electrostatic & Electromagnetic deflection, block diagram, working of oscilloscope, measurement of voltage, current & frequency using oscilloscope, applications multiple trace oscilloscope & digital storage oscilloscope, various oscilloscope probes.
Study the Tachogenerator, Strain gauge, Microphone etc. and measure the different parameters	Special instruments and transducers- Power factor meter, Tachometer, Strain gauge, Microphones, Speakers

II) TOOLS, MACHINERY, EQUIPMENT etc. for a batch of 16 TRAINEES

Category	Sl No	Name of Tool & Equipment	Quantity
Instruments and general shop out fit per unit	1	Oscilloscope Trainer (20 MHz) along with –necessary facility to study the various function, test points to check the voltages, and check the wave shapes	5
	2	LCR meter	4
	3	Oscilloscope 0-20M Hz Single beam	2
	4	Oscilloscope 0-20M Hz double beam	2
	5	Oscilloscope 100 MHz with probes	1
	6	Storage Oscilloscope	1
	7	Electronic Multimeter	8
	8	Wheatstone bridge setup	2
	9	Resistance ratio bridge setup	2
	10	Maxwell bridge setup	2
	11	Shearing bridge setup	2
	12	Galvanometer	8
	13	MI Ammeter 0-1 Amp Panel Type	4
	14	MI Ammeter 0-5 Amp Panel Type	4
	15	MI Ammeter 0-1 Amp Box Type	4
	16	MI Ammeter 0-10 Amp BoxType	4
	17	MI Volt meter 0-300 V Panel Type	4
	18	MI Voltmeter 0-250 V Panel Type	4
	19	MI Voltmeter 0-100 V Box Type	4
	20	MI Voltmeter 0-50V box type	4
	21	Volt meter Dynamo meter type 0-50 V	4
	22	Power factor meter	4
	23	X-Y recorder	4
	24	Single phase energy meter	4
	25	Watt meter various types	4
Instruments and general shop out fit per unit	26	Tacho generator AC & DC	4
	27	FET Millivoltmeter	4
	28	Multimeter Big	4
	29	500 VA Inverter	1
	30	Auto Transformer I/P 230/250V,O/P 0-270 V,5 Amp	1
	31	VTVM (solid state)	2
	32	Soldering & Desoldering station	1

Category	SI No	Name of Tool & Equipment	Quantity
Hand tools	1	Wire Stripper	17
	2	Tester	17
	3	Double bladed electrician knife	17
	4	Tweezer	17
	5	Combination plier	17
	6	Watch maker screw driver	17
	7	Rubber Gloves	17
	8	Heavy duty screw driver	17
	9	Multi meter small	17

III) OTHER REQUIREMENTS

a) LAB AREA 60 sqm

b) LAB FURNITURE

Category	SI no	Name of Tool & Equipment	Quantity
Furniture	1	WORK BENCH / TABLE / TEST BENCH	As required
	2	REVOLVING CHAIR / STOOL [FOR PARTICIPANTS]	16
	3	STAFF TABLE	1
	4	REVOLVING CHAIR [FOR STAFF]	1
	5	STEEL RACKS	As required
	6	STEEL ALMIRAH	As required
	7	STEEL LOCKERS FOR 16 PARTICIPANTS	As required
	8	FIRE EXTINGUISHER	As required
	9	RUBBER MAT	As required

UPGRADATION OF ITIs into CENTERS of
EXCELLENCE (CoE)

SECTOR / AREA: ELECTRONICS

BROAD BASED BASIC TRAINING

(One Year)

MODULE – EBT 06 : BASIC COMPUTERS

(Duration - 8 weeks)

BROAD BASED BASIC TRAINING
(One Year)

MODULE – EBT - 06: BASIC COMPUTERS

(Duration - 8 weeks)

I) COURSE CONTENT

Practical	Theory
Verification of Logic levels Verification of truth table of AND,OR INVERT gate.	Safety precautions and elementary First aid Introduction of Analog, Digital and Binary signals, Logic levels & pulse wave form ,Basic logic functions, Basic logic gates (AND,OR & Invert) Number system: Decimal, Binary, Octal, Hexa decimal system and their arithmetic.
Verification of Boolean laws, Construct the basic gates using NAND & NOR gates & verify the truth table ,Verify the truth table of Ex-OR /EX-NOR gate.	Concept of combinational & sequential Logic circuits., Boolean algebra concept Verification of Boolean laws (Associative, Commutative, Distributive), De-morgan's theorem, Universal logic gates (NAND,NOR) Realization of basic gates using universal logic, Ex-Or / Ex-NOR gate
Identification of System unit and I/O devices, Identify connectors, Identify components on desk top identify drives and capacity, Create folder and files, Drawing pictures using paint, using menus of paint.	Basic blocks of a computer, Hardware and software, I/O devices, HDD,FDD, different types of printers and their advantages, function and inter-connection, Booting concept, Windows O.S., various types of files , folder concept, various ports in the compute, saving ,copying, deleting & retrieving files , mouse operation , POST
Use start menu, check available programs in computer, use search, settings, run and options. Creation of short cuts, changing screen savors.	MS widows: Starting windows and its operation, file management using explorer, Display & sound properties, screen savers, font management ,installation of program, setting and using of control panel., application of accessories, various IT tools and applications, Components of desk top

Editing the text, saving the text, changing the font and size of text. Creation of brochures. Use of mail merge and taking the printouts.	Concept of word processing,: MS word – Menu bar, standard tool bar, page setting, editing, formatting ,advance features i.e. highlighting ,cut & paste, subscript & super subscript ,drawing features, mail merging , tables and borders, printing of document etc. Introduction to power point
Use of search engines, Creation of email accounts, sending and receiving the mails configuration of email clients.	Concept of Internet, Browsers, Web sites, search engines, email, chatting and messenger service. Downloading the files etc.

II) TOOLS, MACHINERY, EQUIPMENT etc. for a batch of 16 TRAINEES

Category	SI No	Name of Tool & Equipment	Quantity
Instruments and general shop outfit per unit	1	Computer System P IV with 256 MB RAM, CD drive, 80 GB HDD, 3 ½ " FDD , 104 Key board , 15" color Monitor,	8
	2	Scanner	2
	3	Printer DOT Matrix 132 Column	1
	4	Printer A 4 size Inkjet	1
	5	Printer Laser jet A4 size	1
	6	Modem	2
	7	Telephone line	1
	8	Internet connectivity	1
	9	LAN card	1
	10	8 port Hub	1
	11	CD writer	1
	12	Widow software latest version with multiple license	1
	13	MS office software with multiple license	1
	14	Digital Electronics Trainer with board facility for conducting practical on TTL & CMOS ICs along with –necessary P/S, facility to provide 16 Logical I/P and display O/P , provision to provide Clock I/P 1Hz, 100 Hz, 1 KHz , 7 segment display along with drivers so that I/P may be connected to drivers to get O/P, current & Volt meters may also be provided	5
	15	Logic probe	2
	16	Logic clip	2
	17	Logic Analyzer	1
	18	Multimeter Big	2
	19	Soldering & Desoldering station	1

Category	SI No	Name of Tool & equipment	Quantity
Hand Tools	1	Wire Stripper	17
	2	Tester	17
	3	Double bladed electrician knife	17
	4	Tweezer	17
	5	Combination plier	17
	6	Watch maker screw driver	17
	7	Digital Multimeter 3 ½ digit	17

III) OTHER REQUIREMENTS

a) LAB AREA 60 Sqm

b) LAB FURNITURES

Category	Sl no	Name of Tool & Equipment	Quantity
Furniture	1	WORK BENCH / TABLE / TEST BENCH	As required
	2	COMPUTER TABLE	8
	3	500 VA UPS SYSTEM	8
	4	TABLE FOR PRINTERS/SCANNERS	2
	5	REVOLVING CHAIR / STOOL [FOR PARTICIPANTS]	16
	6	STAFF TABLE	1
	7	REVOLVING CHAIR [FOR STAFF]	1
	8	STEEL RACKS	As required
	9	STEEL ALMIRAH	As required
	10	STEEL LOCKERS FOR 16 PARTICIPANTS	As required
	11	FIRE EXTINGUISHER	As required
	12	RUBBER MAT	As required

UPGRADATION OF ITIs into CENTERS of
EXCELLENCE (CoE)

SECTOR / AREA: ELECTRONICS

BROAD BASED BASIC TRAINING

(One Year)

MODULE – EBT - 07: WORKSHOP CALCULATION & SCIENCE

(Duration – 2 hours/week - 48 weeks)

BROAD BASED BASIC TRAINING (One Year)

MODULE – EBT - 07: WORKSHOP CALCULATION & SCIENCE

(Duration -2 hours/week - 48 weeks)

I) COURSE CONTENT

1. Basic algebra - algebraic formula – quadratic equations
2. Trigonometry – Trigonometric functions – calculation of areas
3. Mensuration – Find the area and volume of different objects
4. Find the equivalent resistance on Series circuit, parallel circuit
5. Find the equivalent resistance, voltage and current across each component of a series circuit, parallel circuit and series parallel circuit.
6. Solve the series parallel and network circuits using Kirchoff's law
7. Problems related to the DC generator – induced emf, voltage drop, efficiency etc.
8. Dc motor torque – speed related problems
9. Series and parallel circuits of capacitors, charge and voltage
10. Inductors in series and in parallel
11. Find the ac quantities and draw the vector representation
12. Problems on series ac circuits, Impedance, power and power factor
13. Series and parallel resonance circuit, Q factor
14. Calculations on phase voltage, phase current, line voltage, line current in star and delta systems. Find the power and power factor.
15. Find the turns ratio, efficiency and losses in transformers.
16. Find the average dc, load current and efficiency in half wave and full wave rectifiers.
17. Find the I_B , I_C , I_E in various types of biasing circuits and Transistor configuration circuits.
18. Find the gain of the amplifier in various coupling circuits
19. Problems related to OP-AMP circuits
20. Calculate the voltage gain, Current gain and power gain in dB units

21. Problems related to Zener regulator, Series regulator and series parallel regulator circuits.
22. Find the frequency of oscillation in various oscillator circuits.
23. Stress and strain, modules of elasticity
24. Force, bending, twisting and shearing forces and applied problems.
25. Equilibriums of forces and composition of forces
26. Pressure, atmospheric pressure and absolute pressure, problems related with pressure.
27. Problems on conversion of Decimal numbers to binary, octal, and Hex.
28. Addition and subtraction of Binary, Octal and Hex. Numbers
29. Problems on Boolean algebra.
30. Heat and specific heat of solids, liquids and gases, heat gained and heat loss.

**UPGRADATION OF ITIs into CENTERS of
EXCELLENCE (CoE)**

SECTOR / AREA: ELECTRONICS

BROAD BASED BASIC TRAINING
(One Year)

MODULE – EBT - 08: ENGINEERING DRAWING

(Duration – 2 hours/week - 48 weeks)

**BROAD BASED BASIC TRAINING
(One Year)**

MODULE – EBT - 08: ENGINEERING DRAWING

(Duration -2 hours/week - 48 weeks)

I) COURSE CONTENT

1. Engineering drawing and its importance
2. Types of lines and their applications.
3. Free hand sketching of tools
4. Lettering practice.
5. Dimensioning, their methods and specific uses.
6. Types of projections
7. Simple orthographic projections in 1st angle method.
8. 3rd angle projections of various objects and exercises with dimension
9. Isometric views of objects.
10. Sectioning and sectioned views.
11. Draw the symbols for various electrical measuring instruments, switches, fuses, protective and controlling devices in electrical circuits.
12. Wiring diagram for small houses.
13. Draw the symbols of various electronic components.
14. Draw the circuit diagram of various types of rectifiers, amplifiers, oscillators, power supplies, Multivibrators and Inverters.
15. SCR motor speed control circuits.
16. Draw the circuits of shift registers, Counters, Digital clock, Multiplexer,
17. Details of various TTL and CMOS ICs, RAM, EPROM , A/D Converter, D/A Converter.
18. Architecture of Microprocessors and Micro controllers.
19. Interfacing circuits with the peripheral devices
20. Detailed block diagram of Computer.