Syllabus for the subject

of

TRADE THEORY
&
TRADE PRACTICAL

(First Semester)

Electronics Mechanic

(Common for the trades Mechanic Consumer Electronic Appliances and

Technician Power Electronics Systems)

Under

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

Re-Designed in

– 2014 -

By

Government of India
Ministry of Labour & Employment
Directorate General of Employment & Training

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A.   RATIONALE

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess good trade skills to impart skill training. To cope up this quality possession of trade skills is imperative.

Ability to understand and interpret the course content is essential to perform a job / task of Engineering Trades. It is the skills, Knowledge and Attitude which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is imperative for any trade to instructor to have skill so that same can be transferred.

For an instructor it is essential to have in depth knowledge set which enables analyzing the given job and subsequent detail planning. To transfer skill the practical know how is most important criteria as in ITI system skill is the ultimate requirement. To perform a task/job both theoretical and practical knowledge are very much needed. Thus Trade Technology is regarded as basic/hard skills which are base of all skill based training. The Trade Technology syllabus is common for three trades.

1.   Electronics Mechanic

2.   Mechanic Consumer Electronic Appliances

3.   Technician Power Electronics Systems

Recognizing this importance maximum weight age has been given to the Trade Technology in all Engineering Trades in Craft Instructors Training Scheme (CITS) under NCVT.

B. GENERAL INFORMATION

1.	Name of the Course	:	Craft Instructor Training Scheme
2.	Duration of Instructor Training	:	1 Year (Two semesters each of six months duration).
3.	Name of the Subject	:	**TRADE THEORY** **TRADE PRACTICAL**
1.	Applicability	:	i) Electronics Mechanic ii) Mechanic Consumer Electronic Appliances iii) Technician Power Electronics Systems
4.	Examination	:	AITT to be held at the end of semester.
5.	Space Norms	:	(a) One class room of minimum 30 sq .m. area having Minimum width of 5 m. and with 6000 lumen (b) Workshop : 80 sq. meter having minimum width of 8 m. and with 16000 lumen **The electrical equipments of Class room should conform to minimum 3 star Building energy rating as per Bureau of Energy Efficiency (B.E.E.)**
6.	Power Norms	:	(a) 1 KW for Class room (b) 4.5 KW for Workshop.
7.	Unit strength(Batch Size)	:	20
8.	Entry qualification	:	(a) Possessing National Trade Certificate/ National Apprenticeship Certificate in the following Trades i)Electronics Mechanic ii)Mechanic Consumer Electronic Appliances iii) Technician Power Electronics Systems and all the trades under Electronics group operated as on date OR (b) Possessing Diploma /Degree in appropriate branch of Electronics Engineering
9.	Trainers' Qualification	**:**	(a) Academic Qualification: 10th class pass or equivalent. (b) Technical Qualification: Degree in appropriate branch of Electronics Engineering (Degree should be from recognized University) OR

Three year Diploma in appropriate branch of Electronics Engineering (trade concerned) (Diploma should be from recognized Board / Institution).
(c) Experience: Two years for Degree; Five years for Diploma as an Instructor.

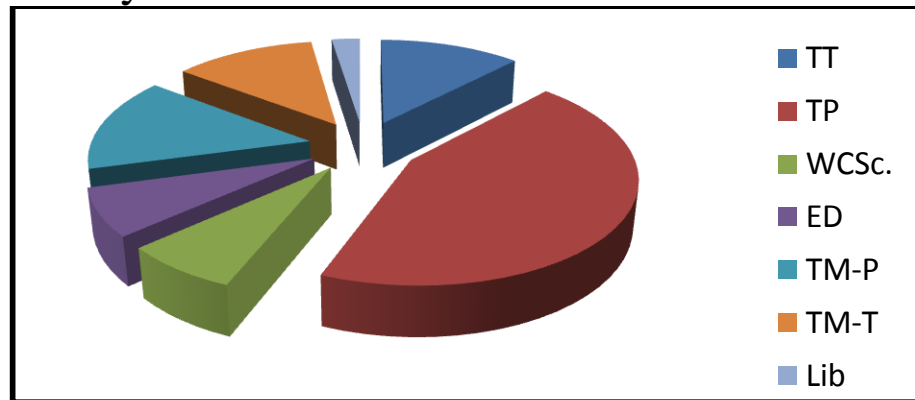Desirable: Passed National Craft Instructor Training course in same or relevant trade.

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In case of two units, one trainer must be Degree in Engineering.

C. SEMESTER WISE ALLOTMENT OF TIME & MARKS AMONG THE SUBJECTS FOR CITS

	SUBJECTS	Hrs. / Week	% of time allotted	Marks	Sessional	Full Marks	Pass Marks		
							Exam.	Sessional	Total
First semester	Trade Practical – 1	20	50	200	30	**230**	120	18	**138**
	Trade Theory - 1	6	15	100	20	**120**	60	12	72
	Workshop Cal. & Sc.	**6**	15	50	-	**50**	30	-	30
	Engineering Drawing	**6**	15	100	-	**100**	60	-	60
	Library	**2**	5	**-**	**-**				
	TOTAL for Sem. - I	**40**		**450**	**50**	**500**	**270**	**30**	**300**
Second semester	Trade Practical – 2	16	40	200	30	**230**	120	18	**138**
	Trade Theory - 2	4	10	100	20	**120**	60	12	72
	Training Methodology - Practical	12	30	200	30	**230**	120	18	**138**
	Training Methodology - Theory + IT	6+2	20	100	20	**120**	60	12	72
	TOTAL	**40**		**600**	**100**	**700**	**360**	**60**	**420**
	GRAND TOTAL	**80**		**1050**	**150**	**1200**	**630**	**90**	**720**

Hourly Distribution   TOTAL: 1200 marks for 2 semesters Pass marks: 720

Subject	Time in %	Marks in %
Trade Practical	45	38
Trade Theory	12.5	20
Total for Trade	**57.5**	**58**
Training Methodology (Practical)	15	19
Training Methodology (Theory) + IT	12.5	10
Total for Training Methodology & IT	**27.5**	**29**
Engineering Drawing	7.5	12
Workshop Cal. & Sc.	7.5	4
Library	2.5	-

D. REVISED SYLLABUS FOR THE TRADE: ELECTRONICS
CRAFT INSTRUCTOR TRAINING SCHEME (First Semester)

Note: During the discussion of any machine tools, related precautions and safety measures should be discussed.

Trade Theory				Trade Practical		
Sl. No.	Topics	Hours	Marks	Topics	Hours	Marks
1	Review of analog and digital electronics circuits	16	15	Review of analog and digital electronics circuits	60	30
2	Electronic circuit simulation software	16	10	Electronic circuit simulation software	40	20
3	Microcontroller (8051)	16	15	Microcontroller (8051)	60	30
4	Sensors ,Transducers and Applications	8	08	Sensors ,Transducers and Applications	40	10
5	UPS, Invertors, SMPS	16	15	UPS, Invertors, SMPS	60	40
6	SMD Soldering and De-soldering	16	10	SMD Soldering and De-soldering	30	10
7	Cables harness& Connectors		10	Cables harness & Connectors		10
8	Computer Hardware, OS, MS office Networking	16	15	Computer Hardware, OS, MS office Networking	60	30
9	Digital panel Meter	12	06	Digital panel Meter	40	10
10	Solar Power (Renewable Energy System)	10	06	Solar Power (Renewable Energy System)	40	10

Sl. No.	Trade Theory	Trade Practical
1.	**Review of analog and digital electronics circuits** Introduction to transistors, working principle of transistors, transistors CB,CE, CC amplifiers, RC coupled amplifiers , Darlington amplifiers Op amp and its applications- inverting, non inverting summing amplifiers, zero crossing detector, instrumentation amplifiers, RC and we in bridge oscillator R-2R ladder DAC ,weighted DAC using Op-amp Astable and monostable multi-vibrators using 555 IC Logic gates, adder circuits , Flip flops , decade counter, multiplexer and de-multi plxers, shift registers , tri state buffers	**Review of analog and digital electronics circuits** • Construct a Transistorized amplifier vary the gain by changing the circuit components • Construct and Test Darlington amplifier • Construct and test Op-amp based RC oscillator circuit. • Construct and test a zero crossing detector • Construct and test Instrumentation amplifier. • Construct and test DAC using IC 0808 and R-2R Ladder weighted Resistor. • Construct and test Astable, monostable, circuits using IC 555. • Construct a dual power supply by using the fixed IC regulators with current limiting and short circuit protection features • Construct the Adder cum Subtractor using IC 7483. • Construct and Test a 3 to 8 Decoder/ Demux using IC 74138 • Construct and Test a priority Encoder using IC 74147. • Construct and Test a 8 to 1 Multiplexer using IC 74151. • Construct and test SIPO and PIPO using IC 7495. • Construct and test ALU IC 74181. • Constructs and test a decade counter using IC7490 • Construct and test a binary counter using IC 749 • Construct and test Modulus(MOD-12) counter. • Construct and test a tri state buffer using suitable IC
2	**Electronic circuit simulation software** Study the library components available in the circuit simulation software. Various resources of the software.	**Electronic circuit simulation software** • Prepare simple digital and analog electronic circuits using the software • Simulate and test the prepared digital and analog circuits • Convert the prepared circuit into a layout diagram. • Explore various troubleshooting and fault finding resources provided in the simulation software.

3.	**Microcontroller (8051)** Differentiate microcontroller with microprocessor. Introduction to 8051 Microcontroller, architecture, pin details, the bus system and I/O ports. Different variants of 8051 & their resources. Register banks & their functioning. SFRs & their configuration for different applications. Function of different ICs used in the Microcontroller Kit. Interfacing of memory to the microcontroller. Internal hardware resources of microcontroller and utilization of on chip resources. Instruction set, addressing modes. Availability of assembly software & complier for 8051. Application of microcontroller in domestic, consumer & industries. Comparative study of 8051 with 8052.	**Microcontroller (8051)** • Identify various ICs & their functions on the given Microcontroller Kit • Identify the address range of RAM & ROM. • Write data into RAM & observe its volatility • Measure the crystal frequency, connect it to the controller. • Identify the port pins of the controller & configure the ports for Input & Output operation • Connect an input switch & control a lamp using necessary program • Demonstrate the initialization, load & turn on a LED with delay using Timer. • Demonstrate the use of a Timer as an Event counter to count external events. • Enter simple programs using assembly language, execute & monitor the results • Enter simple programs using C language, execute & monitor the results
4.	**Sensors ,Transducers and Applications** Basics of passive and active transducers. Role, selection and characteristics of transducer. Standard outputs- 3-15 PSI, 4-20 m A and 1-5V difference and advantages. **Resistive transducer-** Strain gauges – principle, gauge factor, types of strain, disadvantages, applications Load cell – uses, working of strain gauge load cell, applications. Working principle of RTD, advantages and disadvantages, applications. Thermistors – salient features –operating range, composition, advantages and disadvantages, applications	**Sensors ,Transducers and Applications** • Identify sensors used in process industries such as RTDs, Temperature compensation ICs, Thermocouples, proximity switches (inductive, capacitive and photo electric), load cells, strain gauge. LVDT by their appearance • Measure temperature using a Thermocouple and compare readings with data chart. • Measure temperature using RTD and compare readings with data chart. • Measure the strain of a given weight using strain gauge meter. • Measure displacement using LVDT . • Detect different types of objects using capacitive, inductive, photoelectric proximity sensors and pressure transducers

	Thermocouples – basic principle – commonly used combinations, operating range, advantages and disadvantages, applications		

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Thermocouples – basic principle – commonly used combinations, operating range, advantages and disadvantages, applications

Inductive Transducer-

Principle of operation of inductive transducers,- advantages and disadvantages, applications.

Principle of operation of LVDT-its advantages and disadvantages, applications

Capacitive transducer-

Principle and operation of capacitive transducers,- advantages and disadvantages, applications.

Proximity sensors –applications, working principles of limit switch , capacitive and inductive , IR proximity sensors

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UPS, Invertors, SMPS

Concept and block diagram of manual & automatic and servo voltage stabilizer, o/p voltage adjustment, voltage cutoff systems, study of different types of relays used in stabilizers, study of electronic circuit commonly using, buck and boost concept.

Block Diagram of Switch mode power supplies (SMPS)and their working principles.

Various types of chopper circuits- step-up, step down, inverting types.

Introduction to DC-DC Converters. ICs used for converting DC-DC , block diagrams and their pin outs. Applications of DC-DC converters.

The principle, operation, power rating and change over period of inverter. Block diagram of inverter. Installation of inverters, protection circuits used in inverters- battery level, over load, over charging etc.

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UPS, Invertors, SMPS

- Make individual connections between batteries of battery stack and test for healthiness of batteries on stack.
- Identify front panel controls & indicators of UPS.
- Connect Battery & load to UPS & load test on battery mode.
- Measure battery current of UPS by working on Battery Mode & measure load current.
- Open Top cover of UPS & identify isolator transformer & UPS transformer & additional circuit other than inverter
- Identify various circuit boards in UPS and monitor voltages at various test points
- Perform load test to measure backup time.
- Test UPS under Fault condition & rectify fault

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		Principle and working of three phase inverter circuits.	
		Installation of single phase & three phase inverters.	
		Concept of UPS, Difference between inverters & UPS. Basic block diagram of UPS & operation principle of rectifier, battery, inverter, static transfer switch.	
		Types of UPS: OFF line UPS, ON line UPS, Line interactive UPS & their comparisons. UPS specification, load power factor & types of indications and protections.	
		UPS circuit description & working of control circuits, power circuits, alarm circuits, & indicator circuits.	
6.		**SMD Soldering and De-soldering:** Introduction to surface mount technology – advantages Surface Mount components and packages, Introduction to solder paste (flux), Soldering of SM assemblies - Reflow soldering. **SMD package sizes(popular codes, sizes, power rating etc) of-resistors, capacitors, SOD (small outline diodes),MELF (metal electrode leadless face), SOT (small outline transistor)** Tips for selection of hardware, Inspection of SM. **Rework and Repair of Printed Circuit board assemblies-**Introduction to rework and repair concepts. Types of conformal coating and its removal methods. Rework of through hole and surface mount soldered joints. Repair of damaged track Repair of damaged pad Repair of Plated through hole Repair of solder mask Soldering / de-soldering of above components Identification of Programmable Gate Array (PGA) packages. Soldering / De-soldering of above PGA components Cold/Continuity check of PCBs. Identification of lose /dry solders, broken tracks on printed wiring assemblies	**SMD Soldering and De-soldering:** • Identify various connections and the setup required for SMD Soldering station. • Identification of various SMD components like resistor, capacitors, SOD, MELF, SOT etc. • Identification of crimping tools for various IC packages. • Make the necessary settings on SMD soldering station to de-solder various ICs of different packages (at least four) by choosing proper clamping tools. • Make the necessary settings on SMD soldering station to solder various ICs of different packages (at least four) by choosing proper clamping tools. • Familiarizations to rework and repair concepts. • Practical on Types of conformal coating and its removal methods. • Practical on Rework of through hole and surface mount soldered joints. • Practical on Repair of damaged track. Trainees may be taken to a industrial visit to explore the SMD soldering practices.

7.	**Cable harnessing & Connectors** Cable signal diagram conventions. Classification of electronic cables as per the application w.r.t. insulation, gauge, current capacity, flexibility etc. capacities of insulated conductors different types of connector & their terminations to the cables. Male / Female type DB connectors, Ethernet 10 Base cross over cables and pin out assignments, UTP and STP, SCTP Cables. Cable trays. Different types of connectors Servo 0.1" connectors, FTP, RCA, BNC, HDMI. Audio/video connectors like XLR,RCA (PHONO),6.3mm PHONO,3.5/2.5mm PHONO, BANTAM,SPEAKON, DIN, mini DIN, RF connectors, USB, Fire wire, EDGE/ATS-SATA Connectors, VGA,DVI connectors, MIDI etc. PIN OUTS OF-Serial port(RS 232 etc), parallel port(25 pin & 36 pin), Ethernet port(EIA/TIA 568A/B, Cross pin concept), Register Jack (RJ11,RJ14,RJ25,RJ48C/X),VGA,S-video, PDMI,MIDI etc	**Cable harnessing & Connectors** • Identify various types of cables used for various applications viz. insulation, gauge, current capacity, flexibility etc. used in various electronics products. • Identify suitable connectors, solder/crimp /terminate & test the cable sets. • Crimping and testing RJ cable • Preparing and testing serial and parallel ports • Read & follow markings on the connectors for testing the continuity of the prepared cable sets • <u>The set of cables prepared should cover applications like computer, audio, video products, RF,DATA Transmission, IDE etc</u>
8.	**Computer Hardware, OS, MS office Networking** Basic blocks of a computer, concept of Hardware and software, I/O devices, keyboard, types of mouse and their working, Different types of printers, their function and inter-connection and their advantages. Function of HDD, DVD. Various ports in the computer. POST Booting concept. Windows O.S. 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 MS word – Menu bar, standard tool bar, saving, copying, deleting & retrieving files, page setting, editing, formatting ,advance	**Computer Hardware, OS, MS office Networking** • Identification of various indicators, Connectors, ports on the computer cabinet • Identify drives and their capacity. • Identify various connectors and cables inside the cabinet & Identify connections to rear side and front panel of the cabinet • Identify various parts of the system unit and motherboard • Disable certain functionality by disconnecting the concerned cables (like USB, SERIAL, Flat) • Replace the CMOS battery. • Replace/Extend a memory module. • Test and Replace the SMPS • Replace the given HDD on the system • Replace the given DVD on the system • Configuring and troubleshooting display problems

features i.e. highlighting, cut & paste, subscript & superscript drawing features, mail merging , Hyperlink, tables and borders, printing of document etc. Excel – Worksheet basics, data entry and formulae. Moving data in worksheet using tool bars and menu bars, Formatting and calculations, printing worksheet, creating multiple work sheets, creating charts, changing chart types, Adding titles, legends and gridlines, colouring charts, printing charts, placing charts in a word file. Introduction to power point Basics of preparing slides, different design aspects of slides, animation with slides etc Concept of Internet, Browsers, Websites, search engines, email, chatting and messenger service. Downloading the Data and program files etc. **Computer Networking:-** Network features-Network topologies, protocols- TCP/IP, UDP, FTP, models, types, network components, network medias, Specification and standards, types of cables, UTP, STP, Coaxial cables. Network components like hub, Ethernet switch, router, NIC Cards, connectors, media and firewall. Difference between PC & Server. Operating system- NOS-features, types etc. Identify physical topology of a network and members of the network. Future trends in laptop technology and tablets, phablet including their communication with Wi-fi/Bluetooth technology, cloud computing	• Boot the system from different options • Practice various features of OS • Perform maintenance of the computer using standard tools provided in the OS • Install a Printer driver software and test for print outs. • Install antivirus software and scan the system and Explore the configuration options in the antivirus software. • Install MS office software • Use start menu, check available programs in computer, use search, settings, run and options. Creation of short cuts. • Changing screen savers. • Create folder and files. • Drawing pictures using paint, using menus of paint • Explore different Menu/Tool/ Format/status bars of MS word and practice the options: Editing the text, saving the text, changing the font and size of text. • Creation of broachers and taking the printouts. • Prepare a power point presentation on any three known topics with various design features • Prepare a power point presentation with different animation and visual effects. • Invoke excel sheet from MS WORD and vice versa • Convert the given PDF File into WORD File using suitable software. (use free downloadable software). • Use of search engines, Creation of email accounts, sending and receiving the mails configuration of email clients. • Identify the cables and network components. • Making UTP cross cables and testing, Making straight cables and testing, Making cable layout drawing. • Network configuration for LAN and Wi -Fi network

9.	**Digital panel Meter** Different types of seven segment displays, decoders and driver ICs for them. Concept of multiplexing and its advantages. Block diagrams of 7106 and 7107 and their configuration for different measurements. Use of DPM (Digital Panel Meter) with seven segment displays to display different voltage & current signals. Principles of working of LCD. Different sizes of LCDs. Decoder/Driver ICs used with LCDs and their pin-out diagrams. Matrix display, advantages and disadvantages over 7 segments, block diagram of driving circuits. Use of DPM (Digital Panel Meter) with LCD to display different voltage & current signals	**Digital panel Meter** • Identify LED Display module and its decoder/driver ICs • Identify LCD Display module and its decoder/driver ICs • Display a word on a two line LCD • Measure/current flowing through a resistor and display it. Measure/current flowing through a sensor and display it on a LCD module(DPM)
10.	**Solar Power (Renewable Energy System)** Need for renewable energy sources, Solar energy as a renewable resource. Materials used for solar cells. Principles of conversion of solar light into electricity. Basics of photovoltaic's cell. Types of solar cells. Mono crystalline and poly crystalline PV cells. Define Components like Solar cell Module, panel and Arrays. Factors that influence the output of a PV module. SPV systems and the key benefits. Difference between SPV and conventional power. Define solar charge controller or regulator and its role. Safety precautions while working with solar systems.	**Solar Power (Renewable Energy System)** • Install a solar panel to a roof. • Wire a solar panel to a solar controller. • Wire a solar controller to a battery storage station. • Connect storage batteries to a power inverter • Wire a power inverter to an electrical service panel. • Connect and test solar panel to the Inverter and run the load. • Test circuits for voltages. • Installation of Solar Inverter. • Take the trainees to the nearest solar power installation and demonstrate various aspects to cover skills as specified above.

E. List of Tools & Equipment

For a batch of 20 Trainees for the trades of-

1. Electronics Mechanic

2. Mechanic Consumer Electronic Appliances

3. Technician Power Electronics Systems

Under CITS for First Semester

TRAINEES TOOL KIT   FOR 20 TRAINEES + 1 INSTRUCTOR

Sl. No.	Names of the Items	Quantity
1.	Connecting screwdriver 100 mm	11 Nos.
2.	Neon tester 500 V.	11 Nos.
3.	Screw driver set (set of 5)	11 Nos.
4.	Insulated combination pliers 150 mm	11 Nos.
5.	Insulated side cutting pliers 150 mm	11 Nos.
6.	Long nose pliers 150 mm	11 Nos.
7.	Soldering iron 25 W. 240 V.	11 Nos.
8.	Electrician knife	11 Nos.
9.	Tweezers 100mm	11 Nos.
10.	Digital Multi meter (3 ½ digit)	11 Nos.
11.	Soldering Iron Changeable bits 10 W	11 Nos.
12.	De- soldering pump	11 Nos.

B.   General Machinery Shop outfit

Sl. No	Name of the items	Quantity
1.	Steel rule 300mm	3 Nos.
2.	Steel measuring tape-3 m	3 Nos.
3.	Tools maker vice 50mm (clamp)	2 Nos.
4.	Crimping tool (pliers)	2 Nos.
5.	Scriber straight 150mm	2 Nos.
6.	Allen key set (set of 9)	2 Nos.
7.	Double ended spanner (set of 6Nos)	2 Sets
8.	Magnifying lenses 75mm	2 Nos.
9.	Hacksaw frame adjustable	2 Nos.
10.	Cold chisel 20mm	2 Nos.
11.	Scissors 200mm	2 Nos.
12.	Handsaw 450mm	2 Nos.
13.	Drill Machine (electrical)	2 Nos.
14.	First aid kit	1 No.
15.	Fire Extinguisher	2 Nos.
16.	Bench Vice	2 Nos.
17.	Dual DC regulated power supply 30-0-30 V, 2 Amps	4 Nos.
18.	LCR meter (Digital)	2 Nos.
19.	CRO Dual Trace 20 MHz (component testing facilities)	4 Nos.
20.	Battery Charger	2 Nos.
21.	Analog multi meter	2 Nos.
22.	Function generator (Triangular, square and sine wave)	2 Nos.
23.	ELECTRONIC WORK BENCH comprising of DC power supply, DMM, AMM, CRO, Function Generator, Dimmer-stat, component tray, soldering station.	2 Nos.
24.	Dimmer state, 5 Amps	2 Nos.
25.	Analog Component Trainer	4 Nos.
26.	Op Amp trainer	4 Nos.
27.	Digital IC Trainer	4 Nos.
28.	Digital IC Tester	2 Nos.
29.	Digital and Analog Bread Board Trainer	6 Nos.
30.	Rheostats various values and ratings	2 Nos.
31.	Computers in the assembled form (including cabinet, motherboards, HDD, DVD, SMPS, Monitor, KB, Mouse, LAN card, Blue-Ray drive and player), MS Office education version.	10 Nos.
32.	Laptops latest configuration	1 No.
33.	Printer	1 No.
34.	Multi function printer	1 No.
35.	Internet broadband connection Wi- Fi	1 No.
36.	Electronic circuit simulation software with 11 user licenses	1 No.
37.	Different types of electronic and electrical cables, connectors, sockets, terminations (consumables).	As required
38.	Different types of Analog electronic components, digital ICs, power electronic components, general purpose PCBs, bread board, MCB, ELCB(consumables)	As required
39.	Crimping tools as necessary for performing terminations for computer networking	As required
40.	8051 Microcontroller trainer kit with applications	6 Nos.
41.	UPS 5 KVA, 3 KVA	1 No. each
42.	Sensor Trainer kit	3 Nos.
43.	SMPS	4 Nos.
44.	SMD Soldering Station with accessories	4 Sets

45.	Solar power inverter with panels(10 user license)	2 Nos.
46.	Antivirus software (11 user license)	1 no.
47.	Application software	As required

C.   Furniture, Accessories And Audio Visual Aids

Sl. No	Name of the items	Quantity
1.	Instructor's table	2 Nos.
2.	Instructor's chair	4 Nos.
3.	Metal Rack 100cm x 150cm x 45cm	4 Nos.
4.	Lockers with 8 drawers standard size	3 Nos.
5.	Steel Almirah 2.5 m x 1.20 m x 0.5 m	4 Nos.
6.	White board	1 No.
7.	LCD/LED Projector	1 No.
8.	Antistatic rubber mat (as per room size)	As required
9.	Classroom chairs with tables	For a batch of 20
10.	Air-conditioner 2 Ton capacity	2 Nos.
11.	Computer Table	10 Nos.
12.	Computer chairs	20 Nos.
13.	Lab work bench 1.8m X 1 m X.8 m	4 Nos
14.	Wooden stools	20 Nos

List of the Trade Committee Members

Sl. No.	Name & Designation	Organization	Remarks
1.	M.R.K Naidu, Head (CR&D)	ECIL, Hyderabad	Chairman
2.	Pradeep Doshi , SVP	ESSCI, New Delhi	Member
3.	Dr. Malini, HOD	University College of Engg., Osmania University	Member
4.	Uma Reddy, M.D.	Hi-tech Magnetics, Bangalore	Member
5.	T. Venkateswara Sharma, Sr. Officer HR	BEL, Hyderabad	Member
6.	P. Chandrashekhar, MD	Techno Design Group, Hyderabad	Member
7.	S.CH. Appa rao, Manager (operations)	BEL, Hyderabad	Member
8.	Noor Ahmed, Manager	ECIL	Member
9.	Prodeep Doshi, Supervisor	ESSCI	Member
10.	M Manoharan, MD	Automation Solutions, Hyderabad	Member
11.	T Venkateswara Rao. Asstt. Professor	Osmania University, Hyderabad	Member
12.	C. Chandra Sekhar , Director in charge	ATI-EPI, Hyderabad	Member
Mentor			
1.	R.L Singh, DDG(T)	DGET, MOLE, New Delhi	Mentor
2.	Sandhya Salwan, Director. (AT & WT)	DGET, MOLE, New Delhi	Mentor
Members of Core Group			
1.	C.S Murthy, DDT	ATI-EPI, Hyderabad	Team Leader
2.	C.H Ravi , DDT	ATI-EPI, Mumbai	Member
3.	L K Mukherjee, DDT	CSTARI, Kolkata	Member
4.	K. Srinivash Rao, JDT	NIMI, Chennai	Member
5.	C. Ramasubramanian, DDT	AHI, Bangalore	Member
6.	H.C Goyal, DDT	ATI-EPI, Dehradun	Member
7.	Ajaipal Singh, T.O.	DGET, MOLE, NewDelhi	Member
8.	R. Malathi, TO	RVTI(W), Bangalore	Member
9.	D K Ojha, DDT	ATI-EPI, Dehradun	Member
10.	DM Basha, TO	ATI, Mumbai	Member
11.	H N Bargal, TO	ITI, Mumbai	Member
12.	R S Nemade, TO	ITI, Mumbai	Member

Syllabus for the subject

of

TRADE THEORY
&
TRADE PRACTICAL

(Second Semester)

Electronics Mechanic

(Common for the trades Mechanic Consumer Electronic Appliances and

Technician Power Electronics Systems)

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CONTENTS

A. RATIONALE

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess good trade skills to impart skill training. To cope up this quality possession of trade skills is imperative.

Ability to understand and interpret the course content is essential to perform a job / task of Engineering Trades. It is the skills, Knowledge and Attitude which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is imperative for any trade to instructor to have skill so that same can be transferred.

For an instructor it is essential to have in depth knowledge set which enables analyzing the given job and subsequent detail planning. To transfer skill the practical know how is most important criteria as in ITI system skill is the ultimate requirement. To perform a task/job both theoretical and practical knowledge are very much needed. Thus Trade Technology is regarded as basic/hard skills which are base of all skill based training. The Trade Technology syllabus is common for three trades.

1. Electronics Mechanic

2. Mechanic Consumer Electronic Appliances

3. Technician Power Electronics Systems

Recognizing this importance maximum weight age has been given to the Trade Technology in all Engineering Trades in Craft Instructors Training Scheme (CITS) under NCVT.

B. GENERAL INFORMATION

1. Name of the Course : Craft Instructor Training

2. Duration of Instructor Training : 1 Year (Two semesters each of six months duration).

3. Name of the Subject : **TRADE THEORY**
   TRADE PRACTICAL

4. Applicability : i)Electronics Mechanic
   ii) Mechanic Consumer Electronic Appliances
   iii) Technician Power Electronics Systems

5. Examination : AITT to be held at the end of semester.

6. Space Norms : (a) One class room of minimum 30 sq. m. area having Minimum width of 5 m. and with 6000 lumen
   (b) Workshop : 80 sq. meter having minimum width of 8 m. and with 16000 lumen
   The electrical equipments of Class room should conform to minimum 3 star Building energy rating as per Bureau of Energy Efficiency (B.E.E.)

7. Power Norms : (a) 1 KW for Class room
   (b) 3.5 KW for Workshop.

8. Unit strength(Batch Size) : 20

9. Entry qualification : Candidate Appeared/Completed semester-I under CITS Semester-I.

10. Trainers' Qualification **:** (a) Academic Qualification: - 10th class pass or equivalent.
    (b) Technical Qualification: Degree in appropriate branch of Electronics engineering (Degree should be from recognized University)
    OR
    Three year Diploma in appropriate branch of Electronics engineering (trade concerned) (Diploma should be from recognized Board / Institution)
    (c) Experience: Two years for Degree; Five years for Diploma as an Instructor

    Desirable: Passed National Craft Instructor Training course in same or relevant trade.
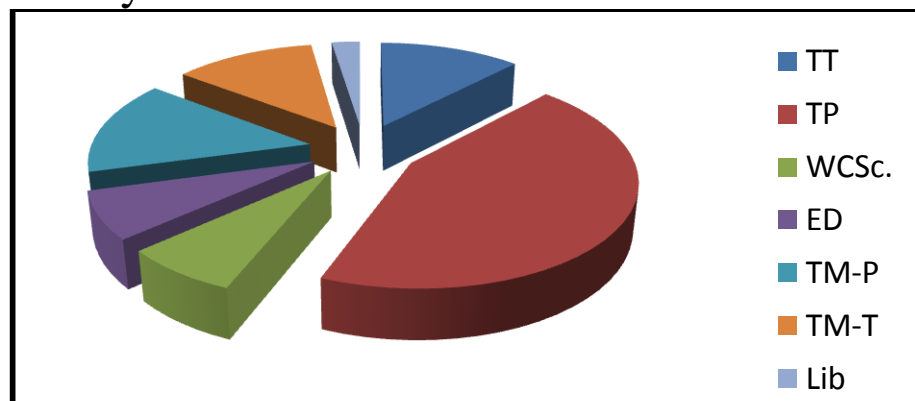
In case of two units, one trainer must be Degree in Engineering.

C.   SEMESTER WISE ALLOTMENT OF TIME & MARKS AMONG THE SUBJECTS FOR CITS

	SUBJECTS	Hrs. / Week	% of time allotted	Marks	Sessional	Full Marks	Pass Marks		
							Exam.	Sessional	Total
First semester	Trade Practical – 1	20	50	200	30	**230**	120	18	**138**
	Trade Theory - 1	6	15	100	20	**120**	60	12	72
	Workshop Cal. & Sc.	**6**	15	50	-	**50**	30	-	30
	Engineering Drawing	**6**	15	100	-	**100**	60	-	60
	Library	**2**	5	**-**	**-**				
	TOTAL for Sem. - I	**40**		**450**	**50**	**500**	**270**	**30**	**300**
Second semester	Trade Practical – 2	16	40	200	30	**230**	120	18	**138**
	Trade Theory - 2	4	10	100	20	**120**	60	12	72
	Training Methodology – Practical	12	30	200	30	**230**	120	18	**138**
	Training Methodology - Theory + IT	6+2	20	100	20	**120**	60	12	72
	TOTAL	**40**		**600**	**100**	**700**	**360**	**60**	**420**
	GRAND TOTAL	**80**		**1050**	**150**	**1200**	**630**	**90**	**720**

Hourly Distribution   TOTAL: 1200 marks for 2 semesters Pass marks: 720

Subject	Time in %	Marks in %
Trade Practical	45	38
Trade Theory	12.5	20
Total for Trade	**57.5**	**58**
Training Methodology (Practical)	15	19
Training Methodology (Theory) + IT	12.5	10
Total for Training Methodology & IT	**27.5**	**29**
Engineering Drawing	7.5	12
Workshop Cal. & Sc.	7.5	4
Library	2.5	-

D. REVISED SYLLABUS FOR THE TRADE: ELECTRONICS

CRAFT INSTRUCTOR TRAINING SCHEME (Second Semester)

Note: During the discussion of any machine tools, related precautions and safety measures should be discussed.

	Trade Theory			Trade Practical		
Sl..No.	Topics	Hours	Marks	Topics	Hours	Marks
1	PIC MICROCONTROLLERS	10	12	PIC MICROCONTROLLERS	40	25
2	LED/LCD TV and CCTV	10	10	LED/LCD TV and CCTV	24	20
3	LED Lights	10	12	LED Lights	28	10
4	Cell phones	06	07	Cell phones	40	10
5	Domestic appliances, washing machine, microwave purifier, immersion heater	12	15	Domestic appliances, washing machine, microwave purifier, immersion heater	40	30
6	PLC	10	12	PLC	40	25
7	Electrical control of AC/DC machines	06	08	Electrical control of AC/DC machines	40	25
8	Electro Pneumatics	10	08	Electro Pneumatics	40	25
9	AC Drives	06	08	AC Drives	40	15
10	Servo Motor	06	08	Servo Motor	20	15

Second semester

Sl. No.	Trade Theory	Trade Practical
1	**PIC MICROCONTROLLERS** Introduction to PIC microcontroller. PIC16 F74 microcontroller outline. Difference between CISC, RISC and applications. Study of 16F/18F series of PIC Family of microcontrollers. Architecture of PIC microcontrollers. Special features of PIC like OSC options, power on reset, power up timer, watch dog timer, brownout reset, low voltage programming. Memory organization of PIC(data memory, flash memory and return address stack). Interrupt vectors and reset vectors. I/O ports and their controlled registers. Parallel slave port mode and its importance. Timers/counters in different modes. Timer as "TI clocks". Timers for measuring Pulse widths and frequencies, timers as PWM outputs. Timer for capture and compare operations of watch dog timer concept. Peripheral interrupts and their applications. ON CHIP peripheral resources like comparators, ADC, AUSART, I2C and SPI interfaces. PICs instruction set, I/O ports and their configuration. Serial communication with USART/I2C/SPI. PIC C-programming basics.	**PIC MICROCONTROLLERS** • Write the RAM & ROM /EPROM address ranges (internal & external) of the given PIC microcontroller kit. • Enter data into specific RAM locations & observe the volatility. • Practice different commands to enter/edit & execute simple assembly programs. • Identify different ICs used in the given PIC microcontroller kit & test vital signals on the ICs. • Enter simple programs, execute & monitor the results. • Configure the port pins as I/P & O/P & apply inputs to activate/deactivate LEDs. • Prepare a program, compile & Dump the code on to the on-chip flash memory of the PIC development & test the functions. • <u>Use embedded 'C'- programming for the following tasks</u> • Control an LED connected to port pin using an I/P switch connected to another port pin. • Blink an LED connected to a port pin with a delay of 500 ms. • Enable a siren using port pin to generate variable audio signals. • Apply an analog I/P signal to an analog I/P pin & display its value on LCD. • Develop & execute capture ,compare & PWM programs. • Develop & execute a program to perform serial communication using on board USART. • Develop & execute a program to perform serial communication using 12 C protocol.

2	**LED/LCD TV and CCTV** Difference between a conventional CTV with LCD & LED plasma TVs. Principle of LCD and LED TV and function of its different section. Basic principle and working of 3D TV. Need of backlight, and difference between CCFL, HCFL, Backlight LED, Edge LED IPS panels and their features. Different types of interfaces like HDMI, USB, RGB etc with latest TVs. CCTV system and its working principle Applications of various external decoders like set top box, digital multimedia player, smart box (web player), BD/DVD Player TV Remote Control –Types, parts and functions, IR Code transmitter and IR Code Receiver, Working principle, operation of remote control. Difference between IR and RF Remote control. Different adjustments, general faults in Remote Control. Introduction to video wall displays.	**LED/LCD TV and CCTV** • Identify and operate different Controls on LCD, LED TV • Identify various connectors provided on a LCD/LED TV and test the healthiness. • Identification of components and different sector of LCD and LED TV. • Dismantle; Identify the parts of the remote control. • Trace and rectify the faults of a various remote controls. • Identify various connectors and connect the cable operator's external decoder (set top box) to the TV. • Install and configure a CCTV system • Record and retrieve the data
3	**LED Lights** Types of LED panels used in various lighting applications. Specifications of LED lamps. Stacking of LEDs. Driving of LED stacks. Types of LED drivers and selecting procedure.	**LED Lights** • Dismantle the LED light, identify the connections of LEDs stacks, protection circuits, regulator • Measure the voltage across LED stacks • Identify the rectifier, controller part of LED lights • Test various subassemblies of the given LED light system
4	**Cell phones** Introduction to mobile communication, concept cell site, hand off, frequency reuse, block diagram and working of cell phones, cell phone features, GSM and CDMA technology. Use IEMI number to trace lost/misplaced mobile phone.	**Cell phones** • using CTC with vibrator tubs • Replace various faulty parts like mic, speaker, data/charging/audio jack Dismantle, identify the parts and assemble different types of smart phones • Dismantle the cell phone/smart phone replace the display • Dismantle the cell phone/smart phone remove the key pad and clean it, test for the continuity of the matrix/tracks • Interface the cell phone/smart phone to the PC and transfer the data • Enhance the memory capacity of the cell phone/smart phone • Connect internet on cell phone and browse popular web sites

		• Flash the various brands of cell phone/smart phone (at least 3) • Upgrade the OS • Format the cell phone/smart phone for virus(approach the mobile repair shop/service centre) • Unlock the handsets through codes and software • Identify the defective parts and rectify • Clean the water damage sets etc.	
5	**Domestic appliances, washing machine, microwave oven ,purifier, immersion heater** Microwave oven: Different types of ovens, study the various functions of Oven, Block diagram of microwave oven, Electrical wiring diagram of microwave oven, Microwave generation system-circuit, description & working, working of Power supply. Washing M/c: different types of machines, washing techniques, (Block diagram) parts of manual, semi automatic and fully automatic machines basic working principle of manual, semi automatic and fully automatic machines, study the working of motors, different types of timers, power supply circuits .Vacuum cleaner working principle, main parts of Vacuum cleaner , study of different features of the machine, study & working of motor used , Electronic circuit, power supply. Various parts & functions of Mixer/Grinder, speed control circuit & auto over load protector. Principle of electric iron, parts of steam iron, thermostat heat controls. Working principal of RO and UV type of water purifiers, Different components of water purifier, consumables required, Most frequently occurring faults and there remedial procedures referring to the manual. Principal of Immersion heater, parts of immersion heater, Insulation in Immersion heater Working principal of Induction cook top, study of different features of machine. Types of induction tubes, study of different	**Domestic appliances, washing machine, microwave purifier, immersion heater** • Identification & use of controls on touch key pad of Microwave oven • Dismantle and identification of various parts, wiring, tracing of various controls of Microwave oven • Identify the faults in the given Microwave oven & rectify • Dismantle and identification of various parts, sensors, wiring, tracing of various controls, Electronic circuits, in various types of washing M/C. • Identify the faults in the given washing M/C. & rectify • Dismantle and identification of various parts, wiring, tracing of various controls, Electronic circuits in various types of Vacuum cleaners. • Identify the faults in various types of Vacuum cleaners & rectify • Dismantle and identification of various parts, wiring, tracing of various controls, Electronic circuits in various types of Mixers/grinders • Identify the faults in various types of Mixers/grinders & rectify • Dismantle and identification of various parts, wiring, tracing of various controls, Electronic circuits in steam Iron • Identify the faults in steam iron & rectify • Identify various components of Electric rice cooker, controls and trace the circuit and rectify the simulated faults. • Identify various component of Water purifier, assembling and dismantling of water purifier ,connection between different parts of water purifier. • Clean and replace the worn out consumable parts following the troubleshooting manual • Simulate and rectify the faults	

	component of induction cook top,Fault identification, Heat sinking in induction cook top.	• Repeat the above exercise for UV type water purifier. • Dismantle and identification of various parts, wiring and connections of immersion heater • Replacing of coil and fixing insulation failure problems. Remove scale formation from heating element. • Identify the faults in Induction cook-top and rectify. • Dismantle and identification of various parts, wiring and tracing of various controls, Electrical and electronics circuit in Induction cook-top. • Replacing the Induction tube (coil) in Induction cook-top.
6	**PLC** Evolution of control technology. Advantages of PLCs. Modular architecture of PLCs, concept of input and output modules (analog &digital), rack, chassis etc, working principle of PLCs. Difference between small, micro, and RACK PLCs. Selection of PLC based on IOs, memory, clock speed, power supply etc. Various modules and addressing Wiring of field devices to various modules, interpretation of indications on CPU and other modules. Specification of PLC Modules, Implementation of relays, timers and counters using PLCs. Difference between PLC programs-ladder logic, functional block diagram, instructional set etc. Small example programs using ladder PLC control and display using HMI and its configuration	**PLC** • Identify various controls, indicators and ports on PLC Modules and interpret • wire various digital input and output devices to the respective modules • wire analog input and output devices to the respective modules • connect and configure PLC hardware on the software • Develop and run simple programs to read sensor status and to control various outputs • Develop and run Digital logic circuit functions. • Force input and output devices using software • Perform online editing of a rung/network • Prepare data tables and monitor for a process • Perform real time operations to control various loads following the system clock. • HMI and its configuration • Monitor and control various operations with screens developed on HMI/ • Explore various features of HMI software.
7	**Electrical control of AC/DC machines** Fundamentals of AC single & 3 phase Induction motors, synchronous speed, slip, rotor frequency, torque – speed characteristics, Starters used for Induction motors, speed control of Induction motors Types of motors: Advantages &	**Electrical control of AC/DC machines** • Identify of (unmarked) terminals of 3 phase induction motors • Construct a self hold contactor circuit and run a 3-Phase Induction Motor • Familiarize with different types of motor and identify different parts. • Study & connect the motor and run (below 5 HP) in star, note phase Voltage, line voltage and current. Study and connect and run the motor in

	Disadvantages among each others. DC Motors– types, working, torque speed characteristics, staring of DC Motors & change the DOR, 3 point and 4 point Starters, speed control of DC motor, Field flux control & armature current control. Brushless DC Motors. Advantages of stepper motor Introduction to EMI, EMC, grounding and electrical leakages	Delta and note phase current line current. Phase voltage and line voltage. • Connect and operate an induction motor using DOL starter • Connect and run a 3-phase motor using manual and automatic star-delta starters.
8	**Electro Pneumatics** Adjust the pressure as per the requirements Introduction to pneumatic power source and measure of compressed air, storage and transmission of compressed air, applications of pneumatics in the industries. Symbols of different pneumatic and electro pneumatic components. Various supply elements such as compressors, reservoir, pressure regulating valve, service unit etc. Various input elements such as push button valves, roller lever valves, proximity switches, Air barriers etc. Various pneumatic control elements, processing elements such as directional control valves, shuttle valves, non-return valves, pressure control valves, Timers and sequencers etc. Function and application of solenoid valves Limit switches, memory valves, pressure dependent valves and time dependent valves.	**Electro Pneumatics** • Identify different pneumatic and electro pneumatic components. • Construct and control a single acting cylinder • Construct and control a double acting cylinder • Construct and control single/double acting cylinder using series/ parallel circuits • Construct and perform bidirectional control of a cylinder. • Construct and control automatic return of a double acting cylinder • Construct and control oscillating motion of a double acting cylinder • Construct and control a latching circuit using single or double acting cylinder • Construct and control automatic return initiated by a limit switch. • Throttle a cylinder to adjust forward and return strokes.
9	**AC Drives** Different power electronic components for switching – MOSFET, IGBT, opto- coupling devices Block diagram of AC Drive – (Sources of supply – Converter /Rectifier – DC Link – Inverter –Motor Load) 1 phase & 3 phase rectifier circuits. Inverter – 1 phase Inverter 3 phase Inverter Switching circuit (Sequence and Switching timing control – PWM Technique & Switching Devices. Microprocessor / Microcontroller) – VFD (Variable Frequency Drive)	**AC Drives** • Study the AC Drive set up and its connections • Identify different cables and connectors used in the AC DRIVE setup • Identify various input and output terminals of the DRIVE unit, Operator panel and display unit. • Familiarization with PMU & different terminals of Micro – Master AC Drive • Demonstration – Access parameter number & values • Familiarization with parameters • Parameter values for various operation • Commissioning parameter numbers and values • Installation of AC Drive(similar to SIEMENS MM-420/440)

	VV VF Control – (3 phase induction motor) Speed control. Solar power VFD inventor for controlling the water pumps Introduction of PID controller. Installation of AC Drive / Siemens Micro master Drive – MM-420/440 Commissioning / Quick commissioning of MM –420/440 Micro – Master Drive – Programming (Parameterization)	• Installation of solar power inverter for water pumps • Familiarization with:- Commissioning & Quick Commissioning(similar to SIEMENS MM-420/440) • Reset to default value / Factory setting values • MM Drive Programming /Parameterization for different control operations- • ON/OFF, Forward/Reverse, Jog (R)/Jog (L), braking and speed control
10	**Servo Motor** Introduction to Servo Motors, Speed control of Servo motors, Introduction to Servo drives. Speed control in Industrial applications, Position control in Industrial applications, Types of Speed control modes Speed controller, Position controller, Torque/Current controller, Feedback mechanism in Servo system. Resolvers, Incremental and absolute encoder.	**Servo Motor** • Connect servo motor with drive & control / monitor its parameters. • Connect servo motor to computer for monitoring & controlling of various parameters. • Parameter programming of servo motor for different applications • Various control method for controlling velocity & torque. • BICO Parameterization techniques • Commands and Speed Referencing • Importance of Key pad for Servo drives • Parameterization of Servo drives • Commissioning of Servo drives • Configuring servo drives through PC • Monitoring of blocks through PC • Modes of Communication to Servo drives

Note: The trainees must be explored to the new trends in the Electronics field periodically with the help of searching on the internet and prepare tutorials

E. List of Tools & Equipment

For a batch of 20 Trainees for the trades of –

1. Electronics Mechanic

2. Mechanic Consumer Electronic Appliances

3. Technician Power Electronics Systems

Under CITS for Second Semester

TRAINEES TOOL KIT FOR 20 TRAINEES + 1 INSTRUCTOR

Sl. No.	Names of the Items	Quantity
1	Connecting screwdriver 100 mm	11 Nos.
2	Neon tester 500 V.	11 Nos.
3	Screw driver set (set of 5)	11 Nos.
4	Insulated combination pliers 150 mm	11 Nos.
5	Insulated side cutting pliers 150 mm	11 Nos.
6	Long nose pliers 150 mm	11 Nos.
7	Soldering iron 25 W. 240 V.	11 Nos.
8	Electrician knife	11 Nos.
9	Tweezers 100mm	11 Nos.
10	Digital Multimeter (3 ½ digit)	11 Nos.
11	Soldering Iron Changeable bits 10 W	11 Nos.
12	De- soldering pump	11 Nos.

B. General Machinery Shop outfit.

Sl. No.	Name of the items	Quantity
1.	Steel rule 300mm	3 Nos.
2.	Tools maker vice 50mm (clamp)	2 Nos.
3.	Crimping tool (pliers)	2 Nos.
4.	File flat 200mm bastard	2 Nos
5.	File flat 200mm smooth	2 Nos.
6.	100mm flat pliers	2 Nos.
7.	Scriber straight 150mm	2 Nos.
8.	Allen key set (set of 9)	2 Nos.
9.	Spanner (set of 6Nos)	2 Sets
10.	Magnifying lenses 75mm	2 Nos.
11.	Continuity tester	4 Nos.
12.	Hacksaw frame adjustable	2 Nos.
13.	Cold chisel 20mm	2 Nos.
14.	Scissors 200mm	2 Nos.
15.	Handsaw 450mm	2 Nos.
16.	Hand Drill Machine	2 Nos.
17.	First aid kit	1 No.
18.	Fire Extinguisher	2 Nos.
19.	Bench Vice	1 No.
20.	Dual DC regulated power supply 30-0-30 V, 2 Amps	4 Nos.
21.	CRO Dual Trace 20 MHz (component testing facilities)	4 Nos.
22.	Signal Generator, 0-100 KHz	2 Nos.
23.	Battery Charger	2 Nos.
24.	Analog multimeter	4 Nos.
25.	Function generator (Triangular, square and sine wave)	2 Nos.
26.	ELECTRONIC WORK BENCH comprising of power supply, DMM, AMM, CRO, Function Generator, Dimmer-stat, component tray, soldering station.	2 Nos.
27.	POWER ELECTRONICS TRAINER with at least 6 no's of onboard applications	4 Nos.
28.	Laptops latest configuration	1 No.
29.	Printer (multi function)	1 No.
30.	Internet broadband connection with Wi- Fi	1 No.
31.	Electric machines trainer to conduct experiments as mentioned in sl. no.7 of TT-II	2 Nos.
32.	AC Drive (VFD) with fractional HP Motor with electrical panel	2 Nos.
33.	Servo Drive with low torque motor with electrical panel	2 Nos.
34.	PLC System with i/o modules, hardware simulator and software	2 Nos.
35.	Electro pneumatic Trainer kit with electro-pneumatic components	2 Nos.
36.	LED/LCD TV	1 No.
37.	LED/LCD TV trainer Kit	1 No.
38.	LED Lighting system	6 Nos.
39.	PIC Microcontroller trainer kit with applications	5 Nos.
40.	UPS 5 KVA, 3 KVA	1 No each
41.	Cell phones/smart phones	4 Nos.
42.	Microwave oven (convection and grill types)	1 No each
43.	Washing machine (fully automatic and semi automatic types)	1 No each
44.	Steam iron	2 Nos.
45.	Mixer/Grinder	1 No
46.	Water purifier (RO and UV types)	1 No each
47.	Immersion heater	4 Nos.

48.	Induction cook-top	2 Nos.
49.	Rice cooker	2 Nos.
50.	CCTV set up with camera 6 monitoring system	1 Set
51.	Computer with latest configuration	10 Nos.

D. WORKSHOP FURNITURE:

E.

Sl. No	Name of the items	Quantity
1	Instructor's table	2 Nos.
2	Instructor's chair	4 Nos.
3	Metal Rack 100cm x 150cm x 45cm	4 Nos.
4	Lockers with 8 drawers standard size	3 Nos.
5	Steel Almirah 2.5 m x 1.20 m x 0.5 m	4 Nos.
6	White board	1 No.
7	LCD/LED Projector	1 No.
8	Antistatic rubber mat (as per room size)	As required
9	Classroom chairs with tables	For a batch of 20
10	Air-conditioner 2 Ton capacity	2 Nos.
11	Computer table	10 Nos
12	Computer chair	20 Nos
13	Lab work bench 1.8m X 1 m X.8 m	4 Nos
14	Wooden stools	20 Nos

List of the Trade Committee Members

Sl. No.	Name & Designation	Organization	Remarks
1.	M.R.K Naidu, Head (CR&D)	ECIL, Hyderabad	Chairman
2.	Pradeep Doshi , SVP	ESSCI, New Delhi	Member
3.	Dr. Malini, HOD	University College of Engg., Osmania University	Member
4.	Uma Reddy, M.D.	Hi-tech Magnetics, Bangalore	Member
5.	T. Venkateswara Sharma, Sr. Officer (HR)	BEL, Hyderabad	Member
6.	P. Chandrashekhar, MD	Techno Design Group, Hyderabad	Member
7.	S.CH. Appa rao, Manager (operations)	BEL, Hyderabad	Member
8.	Noor Ahmed, Manager	ECIL, Hyderabad	Member
9.	Prodeep Doshi, Supervisor	ESSCI, New Delhi	Member
10.	M Manoharan, MD	Automation Solutions, Hyderabad	Member
11.	T Venkateswara Rao. Asstt. Professor	Osmania University, Hyderabad	Member
12.	C. Chandra Sekhar , Director in charge	ATI-EPI, Hyderabad	Member

Mentor

1.	R.L Singh, DDG(T)	DGET, MOLE, New Delhi	Mentor
2.	Sandhya Salwan, Director. (AT & WT)	DGET, MOLE, New Delhi	Mentor

Members of Core Group

1.	C.S Murthy, DDT	ATI-EPI, Hyderabad	Team Leader
2.	C.H Ravi , DDT	ATI, Mumbai	Member
3.	L K Mukherjee, DDT	CSTARI, Kolkata	Member
4.	K. Srinivash Rao, JDT	NIMI, Chennai	Member
5.	C. Ramasubramanian, DDT	AHI, Bangalore	Member
6.	H.C Goyal, DDT	ATI-EPI, Dehradun	Member
7.	Ajaipal Singh, T.O.	DGET, MOLE, NewDelhi	Member
8.	R. Malathi, TO	RVTI(W), Bangalore	Member
9.	D K Ojha, DDT	ATI-EPI, Dehradun	Member
10.	DM Basha, TO	ATI, Mumbai	Member
11.	H N Bargal, TO	ITI, Mumbai	Member
12.	R S Nemade, TO	ITI, Mumbai	Member