GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

WIREMAN

(Duration: Two Years)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 4

SECTOR – POWER

Directorate General of Training

WIREMAN

(Engineering Trade)

(Revised in 2019)

Version: 1.2

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 4

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

EN-81, Sector-V, Salt Lake City,
Kolkata – 700 091
www.cstaricalcutta.gov.in

CONTENTS

S No.	Topics	Page No.
1.	Course Information	1
2.	Training System	3
3.	Job Role	7
4.	General Information	8
5.	Learning Outcome	11
6.	Assessment Criteria	13
7.	Trade Syllabus	19
	Annexure I (List of Trade Tools & Equipment)	40
	Annexure II (List of Trade experts)	46

1. COURSE INFORMATION

During the two-year duration of Wireman trade a candidate is trained on professional skill, professional knowledge, Engineering Drawing, Workshop Calculation & Science and Employability skill related to job role. In addition to this a candidate is entrusted to undertake project work and extracurricular activities to build up confidence. The broad components covered under Professional Skill subject are as below:-

FIRST YEAR: In this year, the trainee learns about safety and environment, use of fire extinguishers, artificial respiratory resuscitation to begin with. He gets the idea of planning & preparing good quality electrical wire joints for single and multi stand conductors suitable for applications with soldering and taking suitable care and safety. The trainee will be able to draw and set up DC and AC circuits including R-L-C circuits with accurate measurement of voltage, current, resistance, power, power factor and energy using ammeter, voltmeter, ohm-meter, watt-meter, energy meter, power factor meter and phase sequence tester with proper care and safety, plan, draw, estimate material, wire up and test different type of domestic wiring circuits as per Indian Electricity rules and taking care of quality, Construction and working of MCB & ELCB. Test a domestic wiring installation using Megger. The trainee will identify the type of batteries, construction, working and application of Ni-cadmium, lithium cell, lead acid cell etc. Demonstrate their charging and discharging, choosing appropriate method and carryout the installation and routine maintenance with due care and safety. He will plan & select to carry out basic jobs of marking out the components for filing, drilling, and riveting, fitting and assembled using different components independently, plan and install Pipe & Plate earthing. Measure earth resistance by earth tester, select and perform electrical/ electronic measurements with appropriate instrument. He should plan and execute electrical illumination system viz. FL tube, HPMV lamp, HPSV lamp, Halogen & metal halide lamp, CFL, LED lamp etc., plan, draw, estimate material, wire up and test different type of industrial wiring circuits as per Indian Electricity rules and taking care of quality. He will be able to plan, draw, estimate material, wire up and test different type of commercial and computer networking wiring circuits as per Indian Electricity rules and taking care of quality.

SECOND YEAR: In this year, the trainee will learn to construct and test Half–wave, full-wave, and bridge rectifiers with filter & without filter. He will be able to identify the constructional features, working principles of DC machine. Starting with suitable starter, running, forward and reverse operation and speed control of DC motors. Conduct the load performance test of DC machine with due care and safety. Maintain and troubleshoot of DC machines. He will recognise the constructional features, working principles of single phase and 3 phase AC motors. Starting with suitable starter, running, forward and reverse operation and speed control of AC motors with due care and safety. He should be able to identify the constructional features, working principles of Alternator set. Test, Wire-up and run alternator. Synchronization of Alternator with due care and

safety, identify the types, constructional features, working principles of transformer (single & three phase) Connect and test Transformer. He should be able to prepare single line diagram and layout plan of electrical transmission & distribution systems and power plants with knowledge of principle applied. Make and test power connection to substation equipments with care and safety. He will select, assemble, test and wire-up control panel, plan, estimate and costing of different types of wiring system as per Indian Electricity rule.

2. TRAINING SYSTEM

2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of Labour market. The vocational training programmes are running under aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer programmes under DGT for propagating vocational training.

The Wireman trade under CTS is one of the most popular courses delivered nationwide through network of ITIs. The course is of two years duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) imparts professional skills and knowledge, while Core area (Workshop Calculation science, Engineering Drawing and Employability Skills) imparts requisite core skill & knowledge and life skills. After passing out of the training programme, the trainee is awarded National Trade Certificate (NTC) by Directorate General of Training (DGT) which is recognized worldwide.

Trainee broadly needs to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan and organize work processes, identify necessary materials and tools;
- Perform tasks with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional knowledge, core skills & employability skills while performing the job, and repair & maintenance work.
- Check the job/ assembly as per drawing for functioning identify and rectify errors in job/ assembly.
- Document the technical parameters in tabulation sheet related to the task undertaken.

2.2 PROGRESSION PATHWAYS:

- Can join industry as Technician and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can appear in 10^{th} examination through National Institute of Open Schooling (NIOS) for acquiring high school certificate and can go further for General/ Technical education.

- Can join Apprenticeship programs in different types of industries leading to a National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming an instructor in ITIs.
- Can join Advanced diploma (Vocational) courses conducted by DGT.

2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years: -

S No.	Course Element	Notional Training Hours	
		1st Year	2nd Year
1	Professional Skill (Trade Practical)	1000	1000
2	Professional Knowledge (Trade Theory)	280	360
3	Workshop Calculation & Science	80	80
4	Engineering Drawing	80	80
5	Employability Skills	160	80
	Total	**1600**	**1600**

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The **Continuous Assessment** (Internal) during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute has to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in.

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTC will be conducted by Controller of examinations, DGT as per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%. There will be no Grace marks.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examining body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
(a) Weightage in the range of 60%-75% to be allotted during assessment	
For performance in this grade, the candidate should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 60-70% accuracy achieved while undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices.	• Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Weightage in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment. • Above 80% accuracy achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Wireman, Light and Power; installs various kinds of electrical wiring such as cleat, conduit, casing, concealed etc. in houses, factories, workshops and other establishments for light and power supply. Studies diagram and plan of wiring and marks light, power and other points accordingly. Fixes wooden pegs, sizes tubes, saws casings, etc. by common carpentry fitting and other processes, according to type of wiring needed. Erects switch boards and fixes switch box casings cleats, conduits ceiling roses, switches, meters etc. according to type and plan of wiring. Draws wire in two way or three-way wiring system as prescribed and makes electrical connections through plugs and switches to different points exercising great care for safety and avoiding short circuit and earthing at any stage of wiring. Fixes fuses and covers as per diagram and insulates all naked wires at diversions and junctions to eliminate chances of short circuit and earthing. Fits light brackets, holders, shades, tube and mercury lights, fans etc, and makes electrical connection as necessary. Tests checks installed wiring for leakage and continuity using megger, removes faults if any and certifies wiring as correct for connecting mains. Checks existing wiring for defects and restores current supply by replacing defective switches, plug sockets, blown fuse etc. or removing short circuits and faulty wiring as necessary. May repair simple electrical domestic appliances.

Reference NCO-2015: 7411.0301 – Wireman, Light and Power

& Science	Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Engineering from AICTE recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years experience in the relevant field. **OR** NTC/ NAC in any one of the engineering trades with three years' experience. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in relevant trade **OR** NCIC in RoDA or any of its variants under DGT.
3. Engineering Drawing	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Engineering from AICTE recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the Electrical, Electronics & IT Trade group (Gr-II) trades categorized under Engg. Drawing'/ D'man Mechanical / D'man Civil' with three years' expeence. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in relevant trade **OR** NCIC in RoDA / D'man (Mech /civil) or any of its variants under DGT.
4. Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills from DGT institutes. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) **OR** Existing Social Studies Instructors in ITIs with short term ToT Course in Employability Skills from DGT institutes.
5. Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

Distribution of training on hourly basis: (Indicative only)						
Year	**Total Hrs /week**	**Trade Practical**	**Trade Theory**	**Workshop Cal. & Sc.**	**Engg. Drawing**	**Employability Skills**
1st	40 Hours	25 Hours	7 Hours	2 Hours	2 Hours	4 Hours
2nd	40 Hours	25 Hours	9 Hours	2 Hours	2 Hours	2 Hours

5. LEARNING OUTCOME

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

5.1 LEARNING OUTCOMES (TRADE SPECIFIC)

FIRST YEAR:

1. Make good quality electrical wire joints for single and multi strand conductors suitable for applications with soldering following electrical safety precautions.
2. Draw and set up DC and AC circuits including R-L-C circuits with accurate measurement of voltage, current, resistance, power, power factor and energy using ammeter, voltmeter, ohm-meter, watt-meter, energy meter, power factor meter and phase sequence tester with proper care and safety.
3. Plan, draw, estimate material, wire up and test different type of domestic wiring circuits as per Indian Electricity rules and taking care of quality. Construction and working of MCB & ELCB. Test a domestic wiring installation using Megger.
4. Identify the type of batteries, construction, working and application of Ni-cadmium, lithium cell, lead acid cell etc. Demonstrate their charging and discharging, choosing appropriate method and carryout the installation and routine maintenance with due care and safety.
5. Make choices to carry out basic jobs of marking out the components for filing, drilling, and riveting, fitting and assembled using different components independently.
6. Plan and install Pipe & Plate earthing. Measure earth resistance by earth tester.
7. Select and perform electrical/ electronic measurements with appropriate instrument.
8. Plan and execute electrical illumination system viz. FL tube, HPMV lamp, HPSV lamp, Halogen & metal halide lamp, CFL, LED lamp etc.
9. Plan, draw, estimate material, wire up and test different type of industrial wiring circuits as per Indian Electricity rules and taking care of quality.
10. Plan, draw, estimate material, wire up and test different type of commercial and computer networking wiring circuits as per Indian Electricity rules and taking care of quality.

SECOND YEAR:

11. Construct and test Half–wave, full-wave, and bridge rectifiers with filter & without filter. Troubleshoot and service of DC regulated power supply.

12. Interpret the constructional features, working principles of DC machine. Starting with suitable starter, running, forward and reverse operation and speed control of DC motors. Conduct the load performance test of DC machine with due care and safety. Maintain and troubleshoot of DC machines.
13. Interpret the constructional features, working principles of single phase and 3 phase AC motors. Starting with suitable starter, running, forward and reverse operation and speed control of AC motors with due care and safety.
14. Interpret the constructional features, working principles of Alternator set. Test, Wire-up and run alternator. Synchronization of Alternator with due care and safety.
15. Interpret the types, constructional features, working principles of transformer (single & three phase) Connect and test Transformer.
16. Prepare single line diagram and layout plan of electrical transmission & distribution systems and power plants with knowledge of principle applied. Make and test power connection to substation equipments with care and safety.
17. Select, assemble, test and wire-up control panel.
18. Plan, estimate and costing of different types of wiring system as per Indian Electricity rule.

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
FIRST YEAR	
1. Make good quality electrical wire joints for single and multi strand conductors suitable for applications with soldering following electrical safety precautions.	Observe safety/ precaution during joints & soldering.
	Make simple straight twist and rat-tail joints in single strand conductors.
	Make married and 'T' (Tee) joint in stranded conductors.
	Prepare a Britannia straight and 'T' (Tee) joint in bare conductors.
	Prepare western union joint in bare conductor.
	Solder the finished copper conductor joints with precaution.
	Prepare termination of cable lugs by using crimping tool.
2. Draw and set up DC and AC circuits including R-L-C circuits with accurate measurement of voltage, current, resistance, power, power factor and energy using ammeter, voltmeter, ohm-meter, watt-meter, energy meter, power factor meter and phase sequence tester with proper care and safety.	Identify types of wires, cables and verify their specifications.
	Verify the characteristics of series, parallel and its combination circuit.
	Analyze the effect of the short and open in series and parallel circuits.
	Verify the relation of voltage components of R.L.C. series circuit in AC.
	Determine the power factor by direct and indirect methods in an AC single phase R, L, C parallel circuit.
	Identify the phase sequence of a 3 ø supply using a phase- sequence meter.
	Prepare / connect a lamp load in star and delta and determine relationship between line and phase values with precaution.
	Connect balanced and unbalanced loads in 3 phase star system and measure the power of 3 phase loads with safety/ precaution.
3. Plan, draw, estimate material, wire up, test different type of domestic wiring circuits as per Indian Electricity rules and taking care of quality. Construction and	Comply with safety & IE rules when performing the domestic wiring.
	Identify the parts of MCB & ELCB and test its operation.
	Identify the types of fuses their ratings and applications.
	Prepare and mount the energy meter board with due care.
	Draw and wire up the consumers main board with ICDP switch and distribution fuse box.
	Draw and wire-up to control lamp controlled from 2 places (stair

working of MCB & ELCB. Test a domestic wiring installation using Megger.	case wiring) on batten wiring as per IE rule.
	Draw and wire-up single phase domestic pump set in PVC conduit wiring as per IE rule.
	Draw and wire-up in casing capping one lamp controlled from 3 different places using intermediate switch as per IE rule.
	Wire –up in PVC conduit wiring for calling bell/buzzer & test them.
	Estimate the material for wiring in PVC casing & capping for two lamps, one fan and one 6A socket outlet & wire-up.
	Test a domestic wiring installation by using Megger.
4. Identify the type of batteries, construction, working and application of Ni-cadmium, lithium cell, lead acid cell etc. Demonstrate their charging and discharging, choosing appropriate method and carryout the installation and routine maintenance with due care and safety.	Assemble a DC source 6V/500 mA using 1.5V cells.
	Determine the Formative resistance of cell and make grouping of cells.
	Identify the parts of a battery charger and test for its operation.
	Demonstrate charging of battery and test for its condition with safety/ precaution.
	Installation and maintenance of batteries.
	Maintain, service and troubleshoot a battery charger.
5. Make choices to carry out basic jobs of marking out the components for filing, drilling, and riveting, fitting and assembled using different components independently.	Identify the trade hand tools; Demonstrate their uses with safety, care & maintenance.
	Prepare a simple half lap joint using firmer chisel with safety.
	Prepare tray using sheet metal with the safety
	Demonstrate fixing surface mounting type of accessories.
	Perform connection of electrical accessories.
	Make and wire up of a test board and test it.
6. Plan and install Pipe & Plate earthing. Measure earth resistance by earth tester.	Measure soil conductivity
	Install the pipe earthing and test it.
	Install the plate earthing and test it.
	Measure the earth electrode resistance using earth tester.
	Carry out earth resistance improvement.

7. Select and perform electrical/ electronic measurements with appropriate instrument.	Identify the type of electrical instruments.
	Determine the measurement errors while measuring resistance by voltage drop method.
	Extend the range of MC voltmeter and ammeter.
	Measure the power and energy in a single & three phase circuit using wattmeter and energy meter with CT and PT.
	Test single phase energy meter for its errors.
	Measure the value of resistance, voltage and current using digital multimeter.
	Measure the power factor in poly-phase circuit and verify the same with voltmeter, ammeter, wattmeter readings.
	Calibrate analog instruments.
	Measure frequency by frequency meter.
	Use meggar for insulation testing
8. Plan and execute electrical illumination system viz. FL tube, HPMV lamp, HPSV lamp, Halogen & metal halide lamp, CFL, LED lamp etc.	Install light fitting with reflectors for direct and indirect lighting.
	Assemble and connect a & single twin tube F.L.
	Connect, install and test the H.P.M.V, H.P.S.V, Halogen & metal hallide lamp with accessories.
	Prepare and test a decorative serial lamp set for 190 V using 6V bulb and flasher.
	Connect the neon sign with the accessories and test it.
	Assemble and install solar photo voltaic light.
	Install light fitting for show case window lighting.
	Install & test CFL & LED lamps.
	Measure intensity of light using LUX Meter.
9. Plan, draw, estimate material, wire up, test different type of industrial wiring circuits as per Indian Electricity rules and taking care of quality.	Comply with safety & IE rules when performing the Industrial wiring.
	Wire-up PVC Conduit wiring for lighting circuit & 3 phase motor circuit with due care and safety.
	Estimate the material required for the given layout for metal conduit wiring for 3 phase 3 HP squirrel cage induction motor & wire-up as per IE rule.
	Make termination to the feeder cable in bus bar & to service cable through plug-in box with due care and safety.
	Erect a bus bar chamber on an angle iron board and wire-up for 3

	phase induction motor with due care and safety.
	Determine the size of cable for main & distribution board of a workshop.
	Test an industrial wiring installation by using Megger.
10. Plan, draw, estimate material, wire up and test different type of commercial and computer networking wiring circuits as per Indian Electricity rules and taking care of quality.	Estimate the material for PVC channel wiring for telephone intercom having 5 instruments from main distribution frame (MDF) with due care.
	Estimate the material and wire-up PVC concealed conduit wiring of three phase installation of 3 stores office building having 4 lamps, 2 fans, one 5 A socket outlet and one buzzer in each room with ELCB protection as per IE rule.
	Draw and wire up a bank/hostel/hospital/commercial establishment in PVC conduit as per IE rule.
	Test a commercial wiring installation by using Megger.
	Wire up and test LAN wiring with due care.
	Install co axial cable from dish antenna to Television set.
	Prepare and connect batteries with UPS with due care and safety.
	Install and test UPS in the circuit with due care and safety.
SECOND YEAR	
11. Construct and test Half–wave, full-wave, and bridge rectifiers with filter & without filter. Trouble shoot and service of DC regulated power supply.	Demonstrate soldering of components.
	Identify passive /active components by visual appearance, Code number and test for their condition.
	Construct and test a half wave, full wave and bridge rectifiers with and without filter circuits.
	Identify the control and functional switches in CRO and measure the D.C. / A.C. voltage, frequency and time period.
	Identify the parts, trouble shoot & service a DC regulated power supply.
12. Interpret the constructional features, working principles of DC machine. Starting with suitable starter, running, forward and reverse operation and speed	Plan work in compliance with standard safety norms related with DC machines.
	Identify the parts of DC machine and measure armature & field resistances and insulation resistance.
	Connect a DC generator, build up the voltage & load with proper safety.
	Disassemble, service and assemble a DC generator with due care.

control of DC motors. Conduct the load performance test of DC machine with due care and safety. Maintain and troubleshoot of DC machines.	Connect the DC motor through 2/3/4 point starter, run, adjust the speed & change direction of rotation.
	Troubleshoot & maintain a DC machine.
13. Interpret the constructional features, working principles of single phase and 3 phase AC motors. Starting with suitable starter, running, forward and reverse operation and speed control of AC motors with due care and safety.	Plan work in compliance with standard safety norms related with AC motors.
	Connect start, run and reverse the DOR of different type of single phase motors.
	Identify the terminals of 3 phase squirrel cage induction motor, wire up, run using different types of starters and change the direction of rotation.
	Determine the efficiency of 3 phase squirrel cage induction motor by no load test/ blocked rotor test and brake test.
	Wire up, start, run and adjust the speed of a slip-ring induction motor.
	Construct DOL, Forward/Reverse starter circuits using push button switches, contactors, overload relays etc.
	Demonstrate power connections to motors.
14. Interpret the constructional features, working principles of Alternator set. Test, Wire-up and run alternator. Synchronization of Alternator with due care and safety.	Plan work in compliance with standard safety norms related with Alternator.
	Identify the parts of an Alternator, measure armature & field resistances and insulation resistance.
	Wire-up, start and run an alternator and build up the voltage.
	Load the Alternator & find out regulation at different loads.
	Synchronise the Alternators with mains.
15. Interpret the types, constructional features, working principles of transformer (single & three phase) Connect and test Transformer.	Plan work in compliance with standard safety norms related with transformer.
	Identify the types of transformers and their specifications.
	Measure winding resistance & Insulation resistance of single phase & 3 phase transformer.
	Identify the terminals; verify the transformation ratio of a single phase and 3 phase transformer.

	Connect and test a single phase auto- transformer.
	Determine the losses (iron loss and copper loss) efficiency and regulation of a single phase transformer at different loads.
	Connect transformers in parallel.
16. Prepare single line diagram and layout plan of electrical transmission & distribution systems and power plants with knowledge of principle applied. Make and test power connection to substation equipments with care and safety.	Plan work in compliance with standard safety norms related with substation & over head lines.
	Prepare layout plan, single line diagram of different type of power plant and project report of all equipment's and machineries of the visited plant.
	Prepare single line diagram of the institute's electrical substation & distribution system.
	Demonstrate testing and use of line protecting devices as per IE rules.
	Make power connection to substation equipments.
	Identify the parts of substation equipments like circuit breakers and operate them.
	Perform crimping of lugs to underground cable and connect the cable to bus bars & equipments with due care.
	Start the generator, build up voltage and synchronise with mains by observing due care and safety.
17. Select, assemble, test and wire-up control panel wiring.	Draw the layout diagram of 3 phase AC motor control cabinet.
	Mount the control elements and wiring accessories on the control panel.
	Demonstrate wiring the control cabinet for local and remote control of induction motor.
	Draw and wire up the control panel for forward/ reverse operation of induction motor.
	Test the control panel for all the required logics.
18. Plan, estimate and costing of different types of wiring system as per Indian Electricity rule.	Prepare layout and wiring diagram of domestic, commercial and industrial installation using IER symbols.
	Record the various electrical wiring accessories available in market with price list and compare it.
	Plan, Estimate and Costing of Domestic wiring as per layout.
	Plan, Estimate and Costing of commercial wiring as per layout.
	Plan, Estimate and Costing of Industrial wiring as per layout.

7. TRADE SYLLABUS

SYLLABUS FOR WIREMAN TRADE			
FIRST YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 125 Hrs; Professional Knowledge 35 Hrs	Make good quality electrical wire joints for single and multi strand conductors suitable for applications with soldering following electrical safety precautions.	1. Implementation in the shop floor of the various safety measures. (2 hrs.) 2. Visit to the different sections of the Institute. (3 hrs.) 3. Demonstration on elementary first aid. Artificial Respiration. (2 hrs.) 4. Practice on use of fire extinguishers. (3 hrs.) 5. Occupational Safety & Health Importance of housekeeping & good shop floor practices. (3 hrs.) 6. Health, Safety and Environment guidelines, legislations & regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. (4 hrs.) 7. Basic safety introduction, Personal protective Equipment (PPE):- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution &	**Occupational Safety & Health** Basic safety introduction, Personal protection:- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Use of Fire extinguishers. Visit & observation of sections. Various safety measures involved in the Industry. Concept of Standard Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies eg; power failure, fire, and system failure. (07 Hrs)

		personal safety message. (3 hrs.) 8. Preventive measures for electrical accidents & steps to be taken in such accidents. (5 hrs.)	
		9. Demonstration of Trade hand tools. (6 hrs.) 10. Identification of simple types-screws, nuts & bolts, chassis, clamps, rivets etc. (7 hrs.) 11. Use, care & maintenance of various hand tools. Familiarization with signs and symbols of Electrical accessories. (12 hrs.)	Identification of Trade-Hand tools-Specifications. (07 hrs)
		12. Practice in using cutting pliers, screw drivers etc. skinning the cables, and joint practice on single strand. (20 hrs.) 13. Demonstration & Practice on bare conductors joints--such as rat tail, Britannia, straight, Tee, Western union Joints. (30 hrs.)	Fundamental of electricity. Electron theory- free electron, Fundamental terms, definitions, units & effects of electric current. (14 hrs)
		14. Practice in soldering & brazing- measurement of Resistant and measurement of specific resistant. (15 hrs.) 15. Application of Wheatstone bridge in measurement of resistance. (10 hrs.)	Solders, flux and soldering technique. Resistors types of resistors & properties of resistors. (07 hrs)
Professional Skill 50 Hrs; Professional Knowledge	Draw and set up DC and AC circuits including R-L-C circuits with accurate	16. Demonstration and identification of types of cables. (6 hrs.) 17. Demonstration & practice on using standard wire gauge &	Introduction of National Electrical Code 2011 Explanation, Definition and properties of conductors, insulators and semi-conductors. Voltage grading of different types

14 Hrs	measurement of voltage, current, resistance, power, power factor and energy using ammeter, voltmeter, ohm-meter, watt-meter, energy meter, power factor meter and phase sequence tester with proper care and safety.	micrometer. (6 hrs.) 18. Practice on crimping thimbles, Lugs. (5 hrs.) 19. Examination and checking of cables and conductors and verification of materials according to the span. (8 hrs.)	of Insulators, Temp. Rise permissible Types of wires & cables standard wire gauge Specification of wires & Cables-insulation & voltage grades -Low , medium & high voltage Precautions in using various types of cables / Ferrules. (07 hrs)
		20. Verification of Ohm's Law. (2 hrs.) 21. Verification of Kirchhoff's Laws. (3 hrs.) 22. Verification of laws of series and parallel circuits. (4 hrs.) 23. Verification of open circuit and closed circuit network. (3 hrs.) 24. Measuring unknown resistance using Wheatstone bridge, voltage drop method. (6 hrs.) 25. Experiment to demonstrate the variation of resistance of a metal with the change in temperature. (7 hrs.)	**Ohm's Law -** Simple electrical circuits and problems. Reading of simple Electrical Layout. **Resistors** -Law of Resistance. Series and parallel circuits. **Kirchhoff's** Laws and applications. Wheatstone bridge principle and its applications. Effect of variation of temperature on resistance. Different methods of measuring the values of resistance. (07 hrs)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Plan, draw, estimate material, wire up and test different type of domestic wiring circuits as per Indian Electricity rules and taking care of quality. Construction and working of MCB &	26. Practice on installation and overhauling **common electrical accessories** as per simple Electrical circuit / Layout. (10 hrs.) 27. Fixing of switches, holder plugs etc. in T.W. boards. (8 hrs.) 28. Identification and use of **wiring** accessories concept of switching. (7 hrs.)	**Common Electrical Accessories**, their specifications in line with NEC 2011-Explanation of switches lamp holders, plugs and sockets. Developments of domestic circuits, Alarm & switches, with individual switches, Two way switch .Security surveillance, Fire alarm, MCB, ELCB, MCCB. (07 hrs)

	ELCB. Test a domestic wiring installation using Megger.		
Professional Skill 75 Hrs; Professional Knowledge 21 Hrs	Identify the type of batteries, construction, working and application of Ni-cadmium, lithium cell, lead acid cell etc. Demonstrate their charging and discharging, choosing appropriate method and carryout the installation and routine maintenance with due care and safety.	29. Assembly of Dry cell-Electrodes-Electrolytes. (4 hrs.) 30. Grouping of Dry cells for a specified voltage and current, Ni cadmium & Lithium cell. (4 hrs.) 31. Practice on Battery Charging, preparation of battery charging. (4 hrs.) 32. Testing of cells, Installation of batteries, Charging of batteries by different methods. (8 hrs.) 33. Practice on Electroplating and anodizing, Cathodic protection. (5 hrs.)	**Chemical** effect of electric current-Principle of electrolysis. Faraday's Law of electrolysis. Basic principles of Electro-plating and Electro chemical equivalents. Explanation of Anodes and cathodes. Lead acid cell-description, methods of charging- Precautions to be taken & testing equipment, Ni-cadmium & Lithium cell, Cathodic protection. Electroplating, Anodizing. Different types of lead acid cells. (07 hrs)
		34. Routine care & maintenance of Batteries. (25 hrs.)	Rechargeable dry cell, description advantages and disadvantages. Care and maintenance of cells Grouping of cells of specified voltage & current, Sealed Maintenance free Batteries, Solar battery. (07 hrs)
		35. Charging of a Lead acid cell, filling of electrolytes- Testing of charging checking of discharged and fully charged battery. (25 hrs.)	Inverter, Battery Charger, UPS-Principle of working. Lead Acid cell, general defects & remedies. Nickel Alkali Cell-description charging. Power & capacity of cells. Efficiency of cells. (07 hrs)
Professional Skill 100 Hrs; Professional	Make choices to carry out basic jobs of marking out the components for	36. Marking use of chisels and hacksaw on flats, sheet metal filing practice, filing true to line. (26 hrs.)	**ALLIED TRADES:** Introduction of fitting trade. Safety precautions to be observed Description of files, hammers,

Knowledge 28 Hrs	filing, drilling, and riveting, fitting and assembled using different components independently.	37. Sawing and planning practice. Practice in using firmer chisel and preparing simple half lap joint. (24 hrs.)	chisels hacksaw frames & blades-their specification & grades. Care & maintenance of steel rule try square and files. Marking tools description & use. Description of carpenter's common hand tools such as saws planes, chisels mallet claw hammer, marking, dividing & holding tools-their care and maintenance. (14 hrs)
		38. Drilling practice in hand drilling & power drilling machines. Grinding of drill bits. (8 hrs.) 39. Practice in using taps & dies, threading hexagonal & square nuts etc. (8 hrs.) 40. Cutting external threads on stud and on pipes, riveting practice. (9 hrs.)	Types of drills description & drilling machines, proper use, care and maintenance. Description of taps & dies, types in rivets & riveted joints. Use of thread gauge. (07 hrs)
		41. Practice in using snips, marking & cutting of straight & curved pieces in sheet metals. (6 hrs.) 42. Bending the edges of sheets metals. (6 hrs.) 43. Riveting practice in sheet metal. Practice in making different joints in sheet metal in soldering the joints. (13 hrs.)	Description of marking & cutting tools such as snubs shears punches & other tools like hammers, mallets etc. used by sheet metal workers. Types of **soldering** irons-their proper uses. Use of different bench tools used by sheet metal worker. Soldering materials, fluxes and process. (07 hrs)
Professional Skill 100 Hrs; Professional Knowledge	Draw and set up DC and AC circuits including R-L-C circuits with accurate measurement of	44. Trace the magnetic field. (8 hrs.) 45. Assembly / winding of a simple electro magnet. (12 hrs.) 46. Use of magnetic compass. (6	**Magnetism –** Classification of magnets, methods of magnetising, magnetic materials. Properties, care and maintenance. Para and Diamagnetism and

28 Hrs	voltage, current, resistance, power, power factor and energy using ammeter, voltmeter, ohm-meter, watt-meter, energy meter, power factor meter and phase sequence tester with proper care and safety.	hrs.) 47. Identification of different types of Capacitors. (10 hrs.) 48. Charging and discharging of capacitor. (8 hrs.) 49. Testing of Capacitors using DC voltage and lamp. (8 hrs.)	Ferro magnetic materials. Principle of electro-magnetism, Maxwell's corkscrew rule, Fleming's left and right hand rules, Magnetic field of current carrying conductors, loop and solenoid. MMF, Flux density, reluctance. B.H. curve, Hysteresis, Eddy current. Principle of electro-magnetic Induction, Faraday's Law, Lenz's Law. Electrostatics: Capacitor-Different types, functions and uses. (14 hrs)
		50. Determine the characteristics of RL, RC and RLC in A.C. Circuits both in series and parallel. (13 hrs.) 51. Experiment on poly phase circuits. (8 hrs.) 52. Current, voltage, power and power factor measurement in single & poly- phase circuits. (15 hrs.) 53. Measurement of energy in single and poly-phase circuits. (8 hrs.) 54. Use of phase sequence meter. (6 hrs.)	**Alternating Current -**Comparison and Advantages D.C and A.C. Related terms frequency Instantaneous value, R.M.S. value Average value, Peak factor, form factor. Generation of sine wave, phase and phase difference. Inductive and Capacitive reactance Impedance (Z), power factor (p.f). Active and Reactive power, Simple problems on A.C. circuits, single Phase and three-phase system etc. Problems on A.C. circuits. Power consumption in series and parallel, P.F. etc. Concept three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load. (14 hrs)

Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Plan and install Pipe & Plate earthing. Measure earth resistance by earth tester.	55. **Practice on Earthing** – different methods of earthing.(13 hrs.) 56. Measurement of Earth resistance by earth tester.(6 hrs.) 57. Testing of Earth Leakage by ELCB and relay. (6 hrs.)	**Earthing**- Principle of different methods of earthing. i.e. Pipe, Plate, etc Importance of Earthing. Improving of earth resistance Earth Leakage circuit breaker (ELCB). In absence of latest revision in respective BIS provision for Earthing it is recommended to follow IEC guidelines. (07 hrs)
Professional Skill 75 Hrs; Professional Knowledge 21 Hrs	Select and perform electrical/ electronic measurements with appropriate instrument.	58. Determine the resistance by Colour coding. (4 hrs.) 59. Identification of active/passive components. (5 hrs.) 60. **Diodes**-symbol - Tests - Construct & Test Half wave rectifier ckt. (8 hrs.) 61. Full wave rectifier ckt. Bridge rectifier ckt. (8 hrs.)	**Basic electronics**- Semiconductor energy level, atomic structure 'P' type and 'N' type. Type of materials –P-N-junction. Classification of Diodes – Reverse and Forward Bias, Heat sink. Specification of Diode PIV rating. Explanation and importance of D.C. rectifier circuit. Half wave, Full wave and Bridge circuit. Filter circuits-passive filter. (07 hrs)
		ELECTRICAL MEASURING INSTRUMENTS- 62. Measurement of voltage, current & resistance in different circuits. (5 hrs.) 63. Direct & indirect measurement of electrical power & energy. (6 hrs.) 64. Calibration of energy meters. (6 hrs.) 65. Measurement of current and voltage using CT & PT, Measurement of 3 Phase energy using CT & PT. Phase	Type of measuring instruments – MC & MI, Construction & working principles of Ammeter, Voltmeter, Ohm-meter ,Wattmeter, Energy meter, P.F. meter, frequency meter, multi meter, clamp meter, Megger & earth tester. Introduction of Digital meters. CT & PT. Tong tester / Clip on Meter. (14 hrs)

		sequence meter, measure current and voltage using Tong tester. (12 hrs.) 66. Power measurement by Two & Three watt meter method Insulation resistance test by Megger. (7 hrs.) 67. Measurement of earth resistance by earth tester. (4 hrs.) 68. Calibration of indicating type analogue instruments: voltmeter, ammeter, and wattmeter. Measurement of soil conductivity. Introduction of Digital meters. (10 hrs.)	
Professional Skill 150 Hrs; Professional Knowledge 42 Hrs	Plan, draw, estimate material, wire up and test different type of domestic wiring circuits as per Indian Electricity rules and taking care of quality. Construction and working of MCB & ELCB. Test a domestic wiring installation using Megger.	**DOMESTIC WIRING - METHODS, INSTALLATION & TESTING-** 69. Demonstration & Practice on connecting **common electrical accessories** in circuits and testing them in series board. (8 hrs.) 70. Demonstration on Testing & replacement of different types of fuses. (6 hrs.) 71. Identification of different **wiring** materials and their specifications. (6 hrs.) 72. Removing of insulation from assorted wires and cables. (10 hrs.) 73. Demonstration and practice crimping thimbles/lugs of various sizes. (8 hrs.) 74. Jointing practice with single and multi-stranded conductors of different wires	Introduction and explanation of electrical **wiring** systems, cleat wiring, casing & Capping, CTS, Conduit and concealed etc., I. E. Rules. Related to **wiring**, National Building codes for house **wiring**, specification and types, rating & material. (07 hrs)

		and cables. (12 hrs.)	
		75. Layout on **wiring** boards. (5 hrs.) 76. Practice in P.V.C. insulated cable **wiring** on wood buttons with distribution board and number of points. (10 hrs.)	Branching of circuits with respect to loads such as lighting and power. CTS/PVC Conduit-surface and concealed/ metal conduit/ PVC casing and capping. IE rules regarding clip distance. Fixing of screws, cable bending etc. (07 hrs)
		77. Practice of **wiring**: A) One lamp controlled by one SP switch, (B) Two lamps controlled by two independent switches, (C) One lamp controlled by two 2way switches (Staircase **wiring**), (D)One lamp controlled by intermediate switch from three different locations, (E)Hospital wiring, (F)Tunnel/ Godown wiring, (G)Hostel wiring, (H)Bell Buzzer Indicator wiring, (I)Domestic wiring practice. (15 hrs.)	Description of different electrical fittings and accessories such as lamp holders, switches, plugs brackets, ceiling rose, cut out etc. IS 732- 1863.Wiring materials used for P.V.C. cables I.E. rules, Indian standards regarding the above wiring such as-clip distance fixing of screws, cable bending etc. (07 hrs)
		78. Demonstration and practice of using Rowel tools. (8 hrs.) 79. Demonstration and practice of casing and capping wiring. (10 hrs.) 80. Testing of wiring installation by using Megger. (7 hrs.)	Description of Rowel tools and Rowel plugs, their sizes, plugging, compound, plugs- wall jumper and their sizes and uses. Introduction to estimation procedure, P.V.C. casing and capping materials, sizes and grades etc. (07 hrs)
		81. Demonstration and practice in cutting and threading conduit pipes. (6 hrs.) 82. Cold and hot bending of pipes. (6 hrs.)	Conduit pipe wiring materials and accessories, types and sizes of conduit. (07 hrs)

		83. Fitting of conduit accessories. (13 hrs.)	
		84. Preparation of conduit threads using different fittings and use of running threads wiring in conduit, using metal clad 3 pin plug, Earthing the conduit using earth clips and earth wire. (20 hrs.)	Layout of Light points, fan points etc. Layout of heating leads etc.- their controls, main switches, distribution boards as per **I.E. rules.** I. E. Rules for earthing conduits using earth clips and earth wire as per IS 732-1863. (07 hrs)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Plan and execute electrical illumination system viz. FL tube, HPMV lamp, HPSV lamp, Halogen & metal halide lamp, CFL, LED lamp etc.	**ILLUMINATION:-** 85. Installation of - Neon Sign tube, Mercury vapour (H.P. & L.P.), Sodium vapour, Halogen Lamps, single tube, double tube, Metal halide lamps. Emergency light. (9 hrs.) 86. Practice on decoration lighting. (7 hrs.) 87. Practice on using LUX Meter. (4 hrs.) 88. Installation and testing of CFL Lamps and LED Lamps (5 hrs.)	Introduction of Illumination- Terms & definitions, laws of illumination, illumination factors, intensity of light –importance of light, colour available. Construction, working & applications of – Incandescent lamp, Fluorescent tube, CFL, Neon sign, Halogen, Mercury vapour and types, sodium vapour etc. Decoration lighting, Drum Switches etc. (07 hrs)
Professional Skill 75 Hrs; Professional Knowledge 21 Hrs	Plan, draw, estimate material, wire up and test different type of industrial wiring circuits as per Indian Electricity rules and taking care of quality.	**INDUSTRIAL WIRING-** 89. Tests on insulating materials. (15 hrs.) 90. Measurement of insulation resistance, of commercial and industrial installation Additional practice in conduit wiring. (30 hrs.) 91. Industrial power wiring involving single phase & 3phase motors with switches & starters. (30 hrs.)	Connections of different types of motors used in industry, their normal methods of wiring, Control , starting and protection devices-their connections, layouts and earthing Code practice for earthing of Industrial Wiring. Wiring methods & types in workshop & factories. (21 hrs)
Professional Skill 75 Hrs;	Plan, draw, estimate material, wire up and test	**COMMERCIAL WIRING-** 92. Inverter wiring./ Control panel wiring / multi-storeyed	Wiring in commercial building- their special precautions as per I.E. rules.

Professional Knowledge 21 Hrs	different type of commercial and computer networking wiring circuits as per Indian Electricity rules and taking care of quality.	building wiring. (15 hrs.) 93. Introduction to LAN wiring. (7 hrs.)	Introduction to LAN wiring. (07 hrs)
		94. Installation of 1 ph. and 3 ph. on line / off line UPS wiring. (15 hrs.) 95. Testing of Industrial wiring and UPS wiring installation. (20 hrs.)	Power drives - Introduction, types, advantages & disadvantages. UPS- Introduction, types, Load calculation, Backup time calculation. (07 hrs)
		96. Straight and cross crimping of RJ-45 cable. (08 hrs.) 97. Crimping of co-axial cable, proper installation of co-axial cable from dish antenna to Television set. (10 hrs.)	Computer networking - Identification of network hardware / component. CAT-6 cable, RJ-45. DTH- Introduction of direct to home system, Music channel wiring/interconnecting couplers. (07 hrs)
Professional Skill 50 Hrs; Professional Knowledge 14 Hrs	Plan, draw, estimate material, wire up and test different type of industrial wiring circuits as per Indian Electricity rules and taking care of quality.	98. Industrial wiring installations for mixed load, both light and power. (9 hrs.) 99. Layout of L.V. AC/DC machines and their panels. (3 hrs.) 100. Wiring of Low power A.C./ D.C. machines in metal conduit system as per I.E. Rules. (10 hrs.) 101. Testing of wiring installation. (3 hrs.)	General idea of fixing meter boards & taking service connection. Sealing of I.C. cut out & meters as per I.E. Rules, General Electric Appliances using heating effect – their capacities, voltage ranges, Calculation of current. (07 hrs)
		102. Wiring of different circuit using Single core cable use for 2 ways, intermediate master switches etc. (20 hrs.) 103. Testing of wiring installation. (5 hrs.)	Explanation of inter connection wiring circuits in the main building and auxiliary blocks, meter boards and its locations. Study of layout symbols in the preparation of layout diagrams. (07 hrs)
Professional	Plan, draw, estimate material,	**COMPUTER AWARENESS:** 104. Identification of Computer	Block diagram of computer, main parts inside the system unit, ports

Skill 50 Hrs; Professional Knowledge 14 Hrs	wire up and test different type of commercial and computer networking wiring circuits as per Indian Electricity rules and taking care of quality.	Parts, Switching ON/OFF of PC, Safety Precautions. (5 hrs.) 105. Identifying and using Windows, like folders, files, Editing and saving. (12 hrs.) 106. Windows Explorer, Notepad, Paint and calculator. (12 hrs.) **OFFICE PACKAGE& INTERNET:** 107. Using /Practicing WORD, EXCEL, POWER POINT for communication. (16 hrs.) 108. Documentation. (2 hrs.) 109. Internet Practicing – Browsing/ Creating Email, Downloading. (3 hrs.)	& connectors, of PC parts & peripherals associated with PC like-keyboard, Mouse, Printers, Scanners, Camera, Modem, External Storage Devices & UPS. Features of Operating System like M.S. Windows, Components of Windows- Calculator, Notepad, Paint, Windows Explorer. **INTERNET:** Websites, Browsing, Downloading Creating and Using E-mail ID's Using it for Communications. (14 hrs)
In plant training / Project work			

SYLLABUS FOR WIREMAN TRADE			
SECOND YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 100 Hrs; Professional Knowledge 36 Hrs	Construct and test Half–wave, full-wave, and bridge rectifiers with filter & without filter. Trouble shoot and service of DC regulated power supply.	110. Identify the terminals of LED, Diode, transistor, Zener diode, UJT, SCR, regulator ICs and test it. (25 hrs.)	LED, Diode, types of transistor, UJT, SCR, regulator ICs and Zener diode uses and its application. (09 hrs)
		111. Construct and test variable DC power supply and trouble shoot the defects in a simple power supply. (25 hrs.)	IC- voltage regulator pin configurations and applications. (09 hrs)
		112. Construction & testing of various electrical circuits with different accessories. (15 hrs.) 113. Connection of Calling Bell, Buzzer, Electric Iron, Heater, Light & Fan etc. (15 hrs.) 114. Practice in **soldering** and brazing by following Indian Electricity rules. (20 hrs.)	**Common Electrical Accessories**, their specifications-Explanation of switches, lamp holders, plugs and sockets etc. Development of domestic circuits using switches, fuse, MCB, sockets, lamp, fan, calling bell/buzzer, Two way switch, I.C.T.P, I.C.D.P, MCCB, ELCB, RCCB etc. Importance of Neutral, effect of opening of neutral wire. **Soldering**- Solders, flux and soldering techniques. Types of soldering irons-their proper use. (18 hrs)
Professional Skill 150 Hrs; Professional Knowledge 54 Hrs	Interpret the constructional features, working principles of DC machine. Starting with suitable starter, running,	**D.C. GENERATORS,** 115. Identification of the parts of D.C. Generators. (5 hrs.) 116. Testing and measuring the field and Armature resistances. (5 hrs.) 117. Dismantle the D.C.	Introduction to D.C Generators and working principle, parts of D.C. Generator. Classification of Generators- Self excited and separately excited-their application in practical field. (09 hrs)

	forward and reverse operation and speed control of DC motors. Conduct the load performance test of DC machine with due care and safety. Maintain and troubleshoot of DC machines.	Generator and Reassemble and test for its working. (15 hrs.)	
		118. Identification of different parts of generators testing fields & Apparatus. (12 hrs.) 119. Insulation resistance measurements. (8 hrs.) 120. Building up of voltage and loading generators. (10 Hrs.) 121. Servicing of generators including replacing of carbon brushes. (20 hrs.)	Types and characteristics of D.C. Generators – Series, Shunt and compound, their applications. Explanation of Armature reaction, interlopes, commutation and EMF equation of DC generators. Parallel operation of Generators. (18 hrs)
		MOTORS & STARTER: 122. Practice in connecting generators- Generators- Testing of D.C. Machines by Megger. (12 hrs.) 123. General maintenance of D.C. machines. (13 hrs.)	**I**ntroduction to D.C. Motor- Working principle, types of motors Explanation of terms used Torque, speed, Back E.M.F. etc. Characteristics, Speed control of DC motors. (09 hrs)
		124. Testing of D.C. Motors - connect run and change direction of rotation. (12 hrs.) 125. Study of DC starters- 2 point 3 point and 4 point speed control of D.C. Motors and speed measurement. (13 hrs.) 126. Use Revolution counter. (6 hrs.) 127. Trouble shooting and fault rectification. Identify and test different types of D.C motors. (19 hrs.)	Necessity of starter- Types of starters, 2 point 3 point and 4 point starters, Protective devices used. Methods of speed control, advantages, disadvantages & Industrial applications. Trouble shooting and fault rectification. (18 hrs)
Professional Skill 50 Hrs;	Interpret the constructional features, working	128. Tests on 3 phase circuit. (10 hrs.) 129. Current and voltage	Introduction to A.C. Poly phase systems- advantages, 3 phase star delta. Terms used in 3Ø systems,

Professional Knowledge 18 Hrs	principles of single phase and 3 phase AC motors. Starting with suitable starter, running, forward and reverse operation and speed control of AC motors with due care and safety.	measurement in star and delta connections. (12 hrs.) 130. Measurement A.C. 3 ph. power. (18 hrs.) 131. Determine the V and I relation in Star/Delta connections in a 3-Ph motor. (10 hrs.)	connection and their relations w.r.t. current and voltage. Principle of measurement of A.C. 3 ph. Power. Simple calculation of A.C. 3 phase circuit parameter - I, V, Z & P.F. etc (18 hrs)
Professional Skill 50 Hrs; Professional Knowledge 18 Hrs	Interpret the constructional features, working principles of Alternator set. Test, Wire-up and run alternator. Synchronization of Alternator with due care and safety.	**A.C. GENERATORS, MOTORS & STARTERS** 132. Identification of Alternator of parts. (10 hrs.) 133. Running of Alternator by prime mover and loading it to find out regulation at different loads. Testing of alternators (IR tests). (28 hrs.) 134. Connect and test Parallel operation of alternators. (12 hrs.)	Parts and construction of Alternators, principle of working, types of Alternators, EMF equation. Various applications and power rating of alternators. General idea of loading and regulation of Alternator. Parallel operation of Alternators, synchronising methods. (18 hrs)
Professional Skill 175 Hrs; Professional Knowledge 63 Hrs	Interpret the constructional features, working principles of single phase and 3 phase AC motors. Starting with suitable starter, running, forward and reverse operation and speed control of AC motors with due care and safety.	135. Demonstration and practice on A.C single phase motors starting and running for specific requirements. (25 hrs.)	Introduction to A.C single phase motors and types. Capacitors start/run- start and run. FHP motors and their uses. Various application of A.C single phase motors. (09 hrs)
		136. Constructional details of three phase squirrel cage induction motor and slip ring induction motor. (12 hrs.) 137. Determination of slip and efficiency. (8 hrs.) 138. Familiarization of DOL	**Three phase Induction motor: -** Construction, Principle of operation of Three phase induction motor. Squirrel cage induction motor and slip ring induction motor. Rotor slip, rotor frequency and rotor torque. Factors affecting torque.

		starter, Star- delta starter, Autotransformer starter and slip ring IM starter. (15 hrs.) 139. Phase sequence test on three phase IM motors, Single phasing preventer. (14 hrs.) 140. Identification of A.C and D.C motors (identify motors from the stock/scrap). (8 hrs.) 141. Construction of simple control circuits using push button and contactors. (18 hrs.)	Effect of variation in applied voltage. Starting methods. Speed control methods. Importance of phase sequence in three phase induction motor. Single phasing preventer. (27 hrs)
		142. Connect and run the A.C single phase and 3-Ph motors by using starters. (25 hrs.)	Starters - DOL starter, Star – delta starter and Auto transformer starter. (09 hrs)
		143. A.C. motor panel wiring (slip ring Induction type) (13 hrs.) **POWER WIRING FOR DC & AC MOTORS** 144. Practice power and control circuits on boards. (10 hrs.) 145. Assembly & testing of the frame for a panel – suitable for motor generator set. I.S. 3072 Part-II of 1861. (15 hrs.) 146. Erection of panel board, fixing of controlling and starting equipment, necessary meters. (12 hrs.)	Description of starter delta starter (manual, semi and Auto). Formative arrangement of a motor resistance starter for slip ring induction motor. Motor control circuit and starting devices. Power and control wiring circuits of AC motors. (18 hrs)
Professional Skill 75 Hrs; Professional	Interpret the types, constructional features, working principles of	147. Identification of types of transformers. (15 hrs.) 148. Test / check the polarity of single phase transformer.	**TRANSFORMERS –** Power Transformer – Its construction, working, performance, parallel operation of

Knowledge 27 Hrs	transformer (single & three phase) Connect and test Transformer.	(10 hrs.) 149. Insulation testing of single phase and Three Phase. (10 hrs.) 150. Conducting No-load/O.C. & short circuit tests. (10hrs.) 151. Connection of transformers, efficiencies of transformers, parallel operation of transformer. (20 hrs.) 152. Ratio test and voltage regulation. (10 hrs.)	transformer, their connections. Cooling of transformer, S.C. & O.C. tests. Regulation and efficiency, Specifications, problems on e.m.f. Equation, transformation ratio. Characteristics of ideal transformer. Construction of core, winding shielding, auxiliary parts breather, conservator. Buchholz's relay, other protective devices. Transformer oil testing and Tap changing off load and on load. Transformer bushings and termination. Auto transformer- Its construction, working, performance & uses. (27 hrs)
Professional Skill 225 Hrs; Professional Knowledge 81 Hrs	Prepare single line diagram and layout plan of electrical transmission & distribution systems and power plants with knowledge of principle applied. Make and test power connection to substation equipments with care and safety.	153. Familiarize and practice operation of OH line components. (20 hrs.) 154. Visit to generating station (Thermal/ Hydro/Nuclear) Visit to a sub-station to familiarize OH line components. (41 hrs.) 155. Prepare a line diagram of the institute/ ITI supply system. (20 hrs.)	**GENERATION, TRANSMISSION AND DISTRIBUTION OF ELECTRICAL POWER** Generation of Electricity and their types. General idea about overhead transmission, distribution (LV, MV & HV) and their types of accessories used. General arrangement and maintenance of outdoor type of substation. Explanation of overhead bus bar, side by bar. Bus trunking and rising mains. I.E. rules regarding panel erection, bus bar, spacing bus bar chamber, danger boards. Connection of high voltage metering equipment used with bus bar. (27 hrs)
		156. Demonstration, testing and use of line protecting	Types of Distribution, Explanation of line protecting devices and

		devices as per I.E. Rules. (10 hrs.) 157. Visit to Distribution - station. (15 hrs.)	their general principle. Brief description of connection of places of use. (09 hrs)
		158. Familiarization and operation of various CBs ACB, VCB, SF6, OCB etc. (15 hrs.) 159. Visit to sub-station. (20 hrs.) 160. Demonstration and Tests on Multi range switches, Rotary switches. (12 hrs.) 161. Cooker control Panel, Power circuit switches Thermostats. Mercury switches, visit/in plant training in a industry. (12 hrs.)	**SUBSTATION EQUIPMENTS** Switchgear-CBs – ACB, VCB, SF6, OCB etc. protection schemes, CT/PT-Protective relays, lightning arrestors, Explanation of different types of switches and switches gears multi Range switches, rotary switches, cooker control panels, power circuit switches, thermostat, mercury switches etc. (27 hrs)
		162. Familiarize the parts of substations low and high voltages. (20 hrs.)	**TYPES OF SUBSTATIONS - INDOOR, OUTDOOR & POLE MOUNTING** Substation construction: i. Outdoor and Indoor substation. ii. E.H.T. substation iii. H.T. substation iv. Medium & low voltage substation (Pole mounting type) (09 hrs)
		163. Demonstration and practice in terminating an U.G. cable to a bus bar chamber. (20 hrs.) 164. Crimping lugs to the conductors of U.G. cable and connection to bus bar Loop connection for other circuit. (20 hrs.)	**U.G. CABLE** Construction of cable, Types , Application & methods of jointing UG cable & testing General idea of laying method and jointing precautions to be observed and different accessories used for medium voltage termination. (18 hrs)

Professional Skill 25 Hrs; Professional Knowledge 09 Hrs	Interpret the constructional features, working principles of Alternator set. Test, Wire-up and run alternator. Synchronization of Alternator with due care and safety.	**Synchronizing** 165. Building up the alternator output voltage, synchronizing of bus bar voltage with generated voltage. (25 hrs.)	Need of Synchronizing, various methods, precautions to be observed while Synchronizing. (09 hrs)
Professional Skill 75 Hrs; Professional Knowledge 27 Hrs	Select, assemble, test and wire-up control panel.	**Control panel wiring** 166. Preparation of control panel board and its layout fixing of indicating meters /Instruments, Control devices, Protection devices. (35 hrs.) 167. Fixing of cable entry and exit points (15 hrs.)	Control Panel elements, types and specifications. Layout and installation of panel board, Panel board wiring methods, colour coding of cables for its easy identification. Grouping and numbering of cables by using ferrules. (09 hrs)
		168. Preventive maintenance and routine tests. (8 hrs.) 169. Fault location and remedy practice both in domestic and industrial wirings. (10 hrs.) 170. Practice in fixing conduit along with the girder, steel structures station etc. (7 hrs.)	Importance and advantages of maintenance. Points to be observed to maintain the installation, preventive maintenance and routine tests. Common faults, causes and remedies in domestic and industrial wiring installation, Methods of Locating faults. (09 hrs)
Professional Skill 75 Hrs; Professional Knowledge 27 Hrs	Plan, estimate and costing of different types of wiring system as per Indian Electricity rule.	**Planning, Estimation and Costing of Wiring-** 171. Planning and Preparation of layout for domestic, commercial, Multi storied building wiring and workshop electrical wiring. (50 hrs.)	Concept and Principle of plan, estimation and cost. Preparation of complete house wiring layout, industrial wiring, commercial wiring for office Lodge, Hospital, Bank, Hotels etc. I.E. rules for Multi-storied buildings. (27 hrs)

		172. Estimation and costing of Labour, materials and accessories as per layout. (25 hrs.)	

Project Work (work in a team)

(i) Over hauling and Testing of 3 phase Induction motor

(ii) Over hauling and testing of Ceiling / Table Fan.

(iii) Preparation of series test board with indicating digital metres.

(iv) Construction and test regulated power supply of 6-12 Volt DC.

(v) Construct and Test Decorative running LED lamp assembly.

(vi) Installation of Pump set.

SYLLABUS FOR CORE SKILLS
1. Workshop Calculation & Science (Common for two years courses) (80 Hrs + 80 Hrs)
2. Engineering Drawing (Group II (Electrical, Electronics & IT trade Group)) (80 Hrs + 80 Hrs)
3. Employability Skills (Common for all CTS trades) (160 Hrs + 80 Hrs)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately inwww.bharatskills.gov.in.

ANNEXURE-I

LIST OF TOOLS & EQUIPMENT			
WIREMAN (For batch of 20 Candidates)			
S No.	**Name of the Tools and Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Steel rule	300 mm	20+1 Nos.
2.	Screw Driver	200 mm	20+1 Nos.
3.	Screw Driver	100 mm	20+1 Nos.
4.	Terminal screw Driver	75 mm (Connector)	20+1 Nos.
5.	Knife Electrician	D.B.	20+1 Nos.
6.	Hammer Ball peen.	0.25 Kg	20+1 Nos.
7.	Plumb bob	115 grams	20+1 Nos.
8.	Combination pliers insulated	200 mm	20+1 Nos.
9.	Neon tester pencil bit type	500 volt	20+1 Nos.
10.	Try square	200 mm	20+1 Nos.
11.	Small crimping tools (assorted)	10 – 100 mm (5 nos)	20+1 Nos.
12.	Spanner set DE	Set of 6 from 6x7 to 16x7	20+1 Nos.
13.	Screw driver set (set of 5)	100 - 300 mm	20+1 Nos.
14.	File half round 2nd cut	250 mm	20+1 Nos.
15.	File round 2nd cut	150 mm	20+1 Nos.
16.	Soldering iron	60 W/230 V	20+1 Nos.
17.	Neon tester	230 V	20+1 Nos.
B. EQUIPMENT, MACHINERY & METERS			
18.	Conduit pipe cutting and threading machines adjustable	for 15 mm to 30 mm.	1 No.
19.	Conduit pipe bending machine, suitable	for 15 mm,18 mm, 25 mm and 30 mm pipe	1 No.
20.	Bar magnet		1 No.
21.	Drill bit	6 mm, 8 mm & 10 mm	1 No. each
22.	Horse shoe magnet		1 No.
23.	Crimping tool	25 mm	1 No.
24.	Crimping tool for telephone/LAN		1 No.

	cable		
25.	Rubber matting	2 meter x 1 meter x 9mm	2 nos.
26.	Wiring board on stand	3 meter x1 meter with 0.5 meter projection on the top	20 Nos.
27.	Fire extinguishers	Dry chemical 5 Kg	2 Nos.
28.	Set of Wall jumper octagonal	37 mm X 450 mm and 37 X 600 mm	4 sets
29.	Center punch	100 mm	2 Nos.
30.	Rule fourfold wood	600 mm	20 Nos.
31.	Bradawl	150 mm X 6mm square pointed	20 Nos.
32.	Set of Rowel punch	8,10 mm	20 Nos.
33.	Wooden mallet	1 kg (75 mm x15 mm)	20 Nos.
34.	Pliers side cutting insulated	200 mm	5 Nos.
35.	Pliers flat nose insulated	150 mm	5 Nos.
36.	Pliers round nose insulated	200 mm	5 Nos.
37.	Pliers long nose insulated	200 mm	5 Nos.
38.	Screw driver heavy duty	200 mm	2 Nos.
39.	Screw driver heavy duty	300 mm	5 Nos.
40.	Firmer chisel	1”	10 Nos.
41.	Firmer chisel	½ ”	10 Nos.
42.	Hammer Ball Peen	0.50 kg.	5 Nos.
43.	Wire stripper	150 mm	5 Nos.
44.	Hammer Ball Peen	1.00 kg	5 Nos.
45.	Hammer cross Peen	0.50 kg.	5 Nos.
46.	Rawal tool holder & Bit	No.8, 10, 14, & 16	2 set
47.	Set of Wall jumper octagonal	37 mm X 450 mm and 37 X 600 mm	4 sets
48.	Scriber	150 mm	2 Nos.
49.	File flat	300 mm rough	5 Nos.
50.	File flat round	150 mm smooth	5 Nos.
51.	File round	300 mm 2nd cut	5 Nos.
52.	File triangular	150 mm 2nd cut	5 Nos.
53.	Spanner set of 6 18X18, 20X22, 21X23, 24 X27, 25X27, 30X32,	Double ended	2 sets
54.	Adjustable spanner	300 mm	1 No.

55.	Foot print Grip	250mm	2 Nos.
56.	Allen keys	Set 5 to 11	1 set
57.	Spirit level	300mm	1 No.
58.	Electric soldering iron	125 Watts 230-250 V	2 Nos.
59.	Blow lamp	1 liter capacity	2 Nos.
60.	Forge with hand blower		1 No.
61.	Bench vice	150mm	5 Nos.
62.	Hand vice	50mm jaw	5 Nos.
63.	Rubber gloves	5000volts	2 pairs
64.	Safety belt with provision for keeping tools		10 Nos.
65.	Tower ladder on type wheels	Min 10ft-Max 30ft	2 Nos.
66.	Portable extension ladder	Aluminum 6 to 9 meters	1 No.
67.	Trowel	150mm	2 Nos.
68.	All types C.F.L. lamp sets	5watt,15watt,2 5watt	3each
69.	Multi meter	0-5, 100, 200, 500 milli amperes 0-100- 1000, 10000 ohms. 0-150, 300, 600 V AC/DC	4 Nos.
70.	Hot wire Ammeter	0-15 Amps.	1 No.
71.	Wheatstone Bridge		1 No.
72.	Electrical power drilling machine	12mm, capacity 250 volts universal type	1 No.
73.	Megger (Insulation tester)	500 volts	2 Nos.
74.	Voltmeter M.C.	O.-300 volts	1 No.
75.	Voltmeter M.C/ Multi range	0.70, 150,300 & 600 V	1 No.
76.	Voltmeter M.C. Multi range	0-15,30,50 & 75 V	1 No.
77.	Voltmeter centre zero	15-0-15 volts	1 No.
78.	Voltmeter M.I. multi- range	0-150, 300, 600 V	2 Nos.
79.	Voltmeter M.I. multi- range	0-50, 75, 150 V	1 No.
80.	Ammeter M.I.	0-30 Amp, panel board type	2 Nos.
81.	Ammeter M.I.	0-5Amp. Panel board type	2 Nos.
82.	Ammeter M.I	0 - 10 Amp. panel board mounting type	1 No.
83.	Ammeter M.C. Centre zero	5-0-5Amp	1 No.
84.	Ammeter MC	0 – 1 Amp	1 No.
85.	Field regulator	0 – 1000 ohmic, 2 Amps	1 No.

86.	Single phase K.W.H meter digital	5A, 250 V A. C	4 Nos.
87.	Single phase K.W.H meter analog	5A, 250 V A. C	4 Nos.
88.	3 Phase KW meter	15A 440 v	1 No.
89.	Watt meter Dynamo meter type	5 Amps. And 250 v, 1.25 kw	1 No.
90.	Personal computer system with printer	CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. RAM:-4 GB DDR-III or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet, with USB Mouse, USB Keyboard and Monitor (Min. 17 Inch.) Licensed Operating System and Antivirus compatible with trade related software.	1 No.
91.	LCD projector		1 No.
92.	Clamp on ammeter	0-25A,0-200A	2 Nos.
93.	Three phase K.W.H meter analog	25A,415 V A. C	4 Nos.
94.	Three phase K.W.H meter digital	25A,415 V A. C	4 Nos.
95.	UPS 500VA with battery	230V	1 No.
96.	D.C. compound motor	3 H.P 250 V with 4 point starter and field regulator (Laboratory type)	1 No.
97.	D.C. shunt motor	3 H.P 250 v with 3 point starter and speed regulator (Laboratory type)	1 No.
98.	D. C. series motor with 2 point starter	3 H.P 250 v with 3 point starter and speed regulator (Laboratory type)	1 No.
99.	DC Power supply	250v DC , 25 Amp	1 No.
100.	Capacitor motor	1/2 H.P. single phase 250 V	1 No.
101.	Split phase motor	1/2 H.P. single phase 250 V	1 No.
102.	Universal motor	1/2 H.P.AC/DC 250 V	1 No.
103.	M.G. Set consisting of squirrel cage induction motor 5 H.P. 400 V cycle with directly coupled compound generator 3K.W. 250 V with built in panel board consisting of :	3 phase air circuit breakers	1set
		Star Delta starter (contact type 8 point) & Automatic type	1 No.
		D.C circuit breaker	1 No.
		Suitable voltmeter on A.C. &	1 No.

		D.C. side	
		Sunk field regulators	1 No.
		Suitable line ammeters on A.C. and D.C. side	1 No.
		Field circuit ammeter	1 No.
		Indicating lamps on both the sides (AC &DC)	1 No.
104.	Squirrel cage induction motor	3 H.P. 400 V with D.O.L. starter	1 No.
105.	Squirrel cage induction motor	5 H.P. 400 V with star delta starter	1 No.
106.	Manual star Delta starter		1 No.
107.	Semi-automatic star Delta starter		1 No.
108.	Automatic star Delta starter		1 No.
109.	Automatic Reverse Forward starter		1 No.
110.	Single phasing preventer	415V	3 Nos.
111.	D.O.L starter		1 No.
112.	Two point starter for DC series motor		1 No.
113.	Soft starter 1ph		1 No.
114.	Tachometer digital type	Non contact type 0-6000 RPM	1 No.
115.	Flux meter		1 No.
116.	Alternator with 3 ph induction motor	2KVA	1 No.
117.	5 HP Slip ring induction motor with rotor resistance starter		1 No.
118.	Lux meter		1 No.
119.	Lead Acid battery 75Ah	12V	1 No.
120.	Battery Charger	15V,Current controlled	1 No.
121.	Solar street light lamp set	12v , 18 / 24 watts	4 no
122.	Hydraulic crimping tool for UG cable crimping with bits	20 sq mm to 250sq mm	1 No.
123.	Transformer single phase	1 K.V.A. 250/100v	2 Nos.
124.	Transformer Three phase (oil cooled)	5 K.V.A. 440/220 v	2 Nos.
125.	Transformer oil testing kit	Automatic 60kv	1 No.
126.	Autotransformer	Single phase 0- 300V 1kVA	2 Nos.

127.	Autotransformer	Three phase 0- 500V 1kVA	2 Nos.
128.	Current transformer	10/1, 20/1,30/1,50/5, 100/5 and 300/5A	1 each
129.	Potential transformer	220/110, 300/110, 440/110, 600/110	1 each
130.	Miniature circuit breaker(MCB)	220V/ 6 Amps	2 Nos.
131.	Earth leakage circuit breaker (ELCB)	220V/25mA	2 Nos.
132.	Metal clad circuit breaker (MCCB)	220V/1A	2 Nos.
C. WORKSHOP FURNITURE'S			
133.	Instructors table (Junior Executive)		1 No.
134.	Instructors chair – Full Arm, Caned Back & Seat		2 Nos.
135.	Metal rack	100x150x45 cm	4 Nos.
136.	Lockers with 16 drawers standard size with key		1 No.
137.	Steel almirah	2.5x1.20x0.50 m	2 Nos.
138.	White board		1 No.
139.	Computer table		1 No.
140.	Computer chair		2 Nos.
141.	Printer and computer table		1 No.
142.	Work bench	2.5x1.20x0.75meters	2 Nos.
143.	Steel locket standard size with 8 Drawers in each		2 Nos.
144.	Almirah	1.8 x 1.2 x 0.45meters	2 Nos.
145.	Demonstration table	2.5 x 1.25 x 0.75 meter	2 Nos.
146.	Blackboard with easel	3' x 6'	1 No.
147.	Stools	1' x 1'x 1.5'	20 Nos.
148.	Metal rack	180 x 150 x 45cm	1 No.

Note: -

1. *All the tools and equipment are to be procured as per BIS specification.*
2. *Internet facility is desired to be provided in the class room.*

ANNEXURE-II

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Expert, trainers of ITIs, NSTIs, faculties from universities and all others who contributed in revising the curriculum. Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

List of member attended the meeting to finalize the course curricula of Wireman Trade			
S No.	**Name & Designation Shri./Mr./Ms.**	**Organization**	**Mentor Council Designation**
Members of Sector Mentor council			
1.	Dr. S.P. Gupta	Professor, IIT Roorkee,	Chairman
2.	Dr. P. Mahanto	Professor, IIT, Guwahati	Member
3.	K. K. Seth	Ex. Director, BHEL, Noida	Member
4.	N. Chattopadhyay	Sr. DGM, BHEL, Kolkatta	Member
5.	A K Gohshal	Professor, IIT, Guwahati	Member
6.	Dr. Bharat Singh Rajpurohit	Asst. Professor, IIT, Himachal Pradesh	Member
7.	Sunand Sharma	Chairman ALSTOM Projects India Ltd.	Member
8.	Dinesh Singhal	Rithani, Delhi road, Meerut	Member
9.	J S S Rao	Principal Director, NTPC, Faridabad	Member
10.	Bhim Singh	Professor, IIT Delhi	Member
Mentor			
11.	Amrit Pal Singh	Dy. Director, DGET, New Delhi	Mentor
Member of Core Group			
12.	R. Senthil Kumar	Director, ATI, Chennai	Member
13.	R.N. Bandopadhyay	Director, CSTARI, Kolkata	Member
14.	S. Mathivanan	Dy. Director, ATI, Chennai,	Team Leader
15.	L K Mukherjee	Dy. Director, CSTARI, Kolkata	Member
16.	B.N. Sridhar	Dy Director, FTI, Bangalore	Member
17.	Ketan Patel	Dy Director, RDAT, Mumbai	Member
18.	B. Ravi	Dy Director, CTI, Chennai	Member

19.	A.S. Parihar	Dy Director, RDAT, Kolkata	Member
20.	Nirmalya Nath	Asst Director, CSTARI, Kolkata	Member
21.	Parveen Kumar	Asst Director, ATI-EPI, Hyderabad	Member
22.	C.C. Jose	Trg Officer, ATI, Chennai	Member
23.	L.M. Pharikal	Trg Officer, ATI, Kolkata	Member
24.	C.M. Diggewadi	Trg Officer, RDAT, Mumbai	Member
25.	Mohan Raj	Trg Officer, NIMI Chennai	Member
26.	M. Asokan	Trg Officer, CTI, Chennai	Member
27.	U.K. Mishra	Trg Officer, ATI, Mumbai	Member
28.	Prasad U.M.	Voc Instructor, MITI, Calicut	Member
29.	D. Viswanathan	ATO. Govt ITI, North Chennai	Member
30.	B. Navaneedhan	ATO, ITI. North Chennai	Member
31.	R. Rajasekar	ATO, ITI, Ambattur, Chennai	Member
32.	K. Amaresan	ATO, Govt ITI, Guindy, Chennai	Member
Other industry representatives			
33.	Surendu Adhikari	OTIS Elevator Co. India Ltd, Kolkata	Member

ABBREVIATIONS

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities


कौशलं बलम्