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

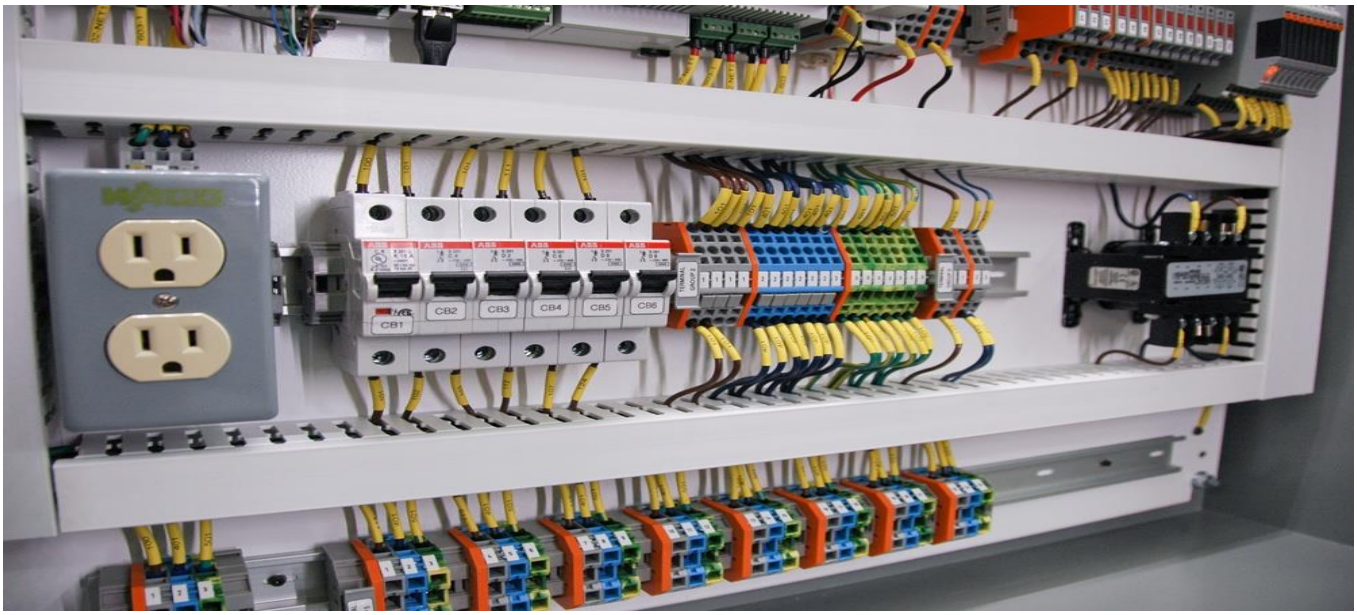
COMPETENCY BASED CURRICULUM

WIREMAN

(Duration: Two Years)
Revised in July 2022

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 4



SECTOR – POWER

WIREMAN

(Engineering Trade)

(Revised in July 2022)

Version: 2.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 4

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

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1. COURSE INFORMATION

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

First Year: -At beginning the trainee learns about safety and environment, use of fire extinguishers and artificial resuscitation etc. He practices basic allied trade jobs viz., filing, drilling, riveting, fitting, joining, etc. He gets the idea of trade tools & its standardization, He identifies different types of conductors, cables & prepares electrical wire joints and carries out crimping, soldering and brazing. The trainee understands basic electrical laws like Kirchhoff's law, ohm's law, laws of magnetism and their application in electrical circuits. He performs measurement of various electrical parameters and Sealing of energy meters and Monitors meter readings using MRI. The trainee understands concepts of generation, transmission, distribution of electrical power including renewable energy sources. The trainee learns to prepare Plate and Pipe earthing installations. He carries out connections, testing, and maintenance of AC/ DC machines including transformers &motor starters. The trainee learns to read, understand and draw electrical Schematics. He learns to plan, draw, estimate material/cost and performs various domestic wiring, control panel wiring and understands importance of EMI/EMC, Bonding & Grounding. He learns to install, test and maintenance of batteries and solar cell.

Second Year: -In this year the trainee learns to plan, draw, estimate material/cost and performs various commercial and industrial wiring including installation of inverter, CCTV camera, cable management and temporary electrical wiring at construction site. The trainee practices on illumination system for domestic, commercial and industrial requirements, operation of PAR light on DMX controller (Stage light control), remote control of fan and light, sensors for bathing area, motion detector sensors, kitchen under-cabinet lighting, shelf lighting, closet lighting, cove lighting, display spotlights and LED downlights, etc. He assembles basic electronic circuit like rectifiers and repairs CFL & LED Lamps. The trainee practices to assemble different solar components like charge controller, solar PV panels, batteries etc., and install small solar plant, solar street light, Solar pump and other Solar DC appliances. He practices on jointing of LT/HT underground cables using cable jointing kits. The trainee will practice on Electric Vehicle charging systems, their installation & diagnostics. He/she learns to repair domestic appliances viz., cooking range, food processor, fan, washing machine, geyser, water pump etc. including repair of electrical faults in refrigerator, window and split AC. The individual performs winding of small transformers and motors viz., ceiling fan, table fan, mixer/grinder, submersible pump etc. The trainee also understands the concept of structured / smart wiring for automation and IoT applications. The trainee also gets awareness about different software used for electrical wiring, solar PV e-learning, LED video wall panel and wireman licensing procedure etc.

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 (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)	840	840
2	Professional Knowledge (Trade Theory)	240	300
3	Employability Skills	120	60
	Total	**1200**	**1200**

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry, wherever not available then group project is mandatory.

4	On the Job Training	150	150

Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for 10th/ 12th class certificate along with ITI certification, or, add on short term courses

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%.

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 assessment. Due consideration to be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitive to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude to be considered while assessing competency.

Assessment will be evidence based comprising some of 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
- Computer based multiple choice question examination
- Practical Examination

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

Performance Level	Evidence
(a) Marks 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) Marks 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) Marks+ 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.

Cable Jointer; joins multi-conductor cable consisting of number of various coloured wires on the surface or underground. Selects strands of wires to be joined from cable ends according to colour code and removes insulation from end of wires in cables, slips separate pieces of copper or lead sleeves with linear slits over ends of cables and brings ends of naked wires of cables in overlapping contacts according to colour code. Twists overlapping ends of naked wires to join strands and solders or brazes each strand of wire of one cable with corresponding one of other. Dries joint and wraps it with insulating material. Adjusts sleeves over joint keeping slits face to face and heats and solders sleeves together to strengthen and protect joint made. Screws soldered cable in position in cable junction box by tightening bolts and fuses upper portion of box with pitch or other compound to completely insulate cable against leakage and moisture. Tests pairs of wires for electrical continuity and insulation, using testing equipment. May be designated as **Cable Jointer Light and Power** according to type of cables joined.

Meter Sealer, Electrical; seals electrical meters, main switch boards and consumers cut outs using special sealing plier, wire and lead to prevent tampering and pilferage of current. Visits consumers premises, industrial places etc., connected with electric supply. Checks current supply equipment such as meters, fuse boxes, cut outs etc. for proper fixing. Seals meters main switch cover and cut outs where necessary using wire lead and sealing plier, to ensure that no one can open or tamper with without breaking their respective seals. Makes periodical visits to premises to check whether meter seals and switches are intact and are not tampered with for illegal use of electric current. Reports to superiors of illegal tapping from supply lines. May attend calls to replace fuses.

Field Technician, Other Home Appliances; is also called, 'Home Appliance Repair Technician', this is an after sales service job for installing and providing support to the water purifier, mixer/grinder buyers. The individual at work installs the appliance and interacts with customers to diagnose the problem and possible causes. Once the problem and causes have been identified, the individual rectifies minor problems or replaces faulty modules for failed parts or recommends factory repairs for bigger faults.

Electrician, Stage and Studio; controls lighting equipment, such as flood lamps, strip lights, and spotlights from projection room and front or backstage areas of theatre to cast spotlight on stage performers. Places spotlights in specified locations in theatre and connects wiring for lighting. Moves spotlight to follow movements of performers with beam of light, according to instructions on prepared cue sheet. Turns colour wheel, causing light to be diffused through varicoloured gelatine disks to change colour of light. Cleans and adjusts light, replacing carbons or bulbs as needed. May insert varicoloured gelatine sheets in frame to assemble colour wheel.

Solar Panel Installation Technician; is also known as 'Panel Installer', the Solar Panel Installation Technician is responsible for installing solar panels at the customers' premises. The individual at work checks the installation site, understands the layout requirement as per design, assesses precautionary measures to be taken, installs the solar panel as per customer's requirement and ensures effective functioning of the system post installation.

Reference NCO-2015:

(i) 7411.0301 - Wireman, Light and Power
(ii) 7422.0800 - Cable Jointer
(iii) 7411.0500 - Meter Sealer, Electrical
(iv) 7421.0701 - Field Technician, Other Home Appliances
(v) 7411.0600 - Electrician, Stage and Studio

Reference NOS:

i) PSS/N1707
ii) PSS/N2512
iii) PSS/N1331
iv) PSS/N7001
v) PSS/N6002
vi) PSS/N1709
vii) PSS/N6003
viii) PSS/N4402
ix) PSS/N1711

PSS/N9401

x) PSS/N9402,
xi) PSS/N9411,
xii) PSS/N9412,
xiii) PSS/N9413,
xiv) PSS/N9414

4. GENERAL INFORMATION

Name of the Trade	**WIREMAN**
Trade Code	DGT/1009
NCO - 2015	7411.0301, 7422.0800, 7411.0500, 7421.0701, 7411.0600
NOS Covered	PSS/N1707, PSS/N2512, PSS/N1331, PSS/N7001, PSS/N6002, PSS/N1709, PSS/N6003, PSS/N4402, PSS/N1711, PSS/N9401 PSS/N9402, PSS/N9411, PSS/N9412, PSS/N9413, PSS/N9414
NSQF Level	Level-4
Duration of Craftsmen Training	Two Years (2400 hours + 300 hours OJT/Group Project)
Entry Qualification	Passed 8th class examination
Minimum Age	14 years as on first day of academic session.
Eligibility for PwD	LD, LC, DW, AA, DEAF, HH
Unit Strength (No. Of Students)	20 (There is no separate provision of supernumerary seats)
Space Norms	88 Sq. m
Power Norms	5 KW
Instructors Qualification for:	
1. Wireman Trade	B.Voc/Degree in Electrical/ Electrical and Electronics Engineering from AICTE/UGC recognized Engineering College/ university with one year experience in the relevant field. **OR** 03 years Diploma in Electrical / Electrical and Electronics 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 passed in the Trade of "Wireman" with three years' experience in the relevant field.

	<u>Essential Qualification</u>: Relevant Regular / RPL variants of National Craft Instructor Certificate (NCIC) under DGT. ***Note: Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However both of them must possess NCIC in any of its variants.***
2. Workshop Calculation & Science	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 engineering trades with three years' experience. **<u>Essential Qualification:</u>** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade **OR** Regular / RPL variants 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 Mechanical group (Gr-I) trades categorized under Engg. Drawing'/ D'man Mechanical / D'man Civil' with three years' experience. **<u>Essential Qualification:</u>** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade **OR** Regular / RPL variants of 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. (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.
5. Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

5. LEARNING OUTCOMES

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

5.1LEARNING OUTCOMES

FIRST YEAR:

1. Apply safety precautions and prepare profile with an appropriate accuracy as per drawing using basic jobs of marking components, filing, drilling, riveting, fitting, joining etc. (NOS: PSS/N1707)
2. Prepare terminations, make good quality of electrical wire joints for single and multi-strand conductors and carry out crimping, soldering and brazing. (NOS: PSS/N2512, PSS/N1331)
3. Draw and set up DC and AC circuits, involving R-L-C components, perform measurement of various electrical parameters with due care and safety. Carry out Sealing of energy meters and Monitor meter readings using MRI. (NOS: PSS/N1707)
4. Explain basic concepts of generation, transmission and distribution of electrical power including renewable energy. (NOS: PSS/N7001)
5. Plan and prepare Plate and Pipe earthing installations and ensure safe and effective earthing. (NOS: PSS/N6002)
6. Carry out wiring, testing, and maintenance of DC machines including DC motor starters. (NOS: PSS/N9411)
7. Carry out wiring, testing, and maintenance of small transformers, 1ϕ & 3ϕ AC motors and Alternators including AC motor starters. (NOS: PSS/N9412)
8. Read, understand and draw electrical Schematic drawings of power and control circuits using industry standard symbols. (NOS: PSS/N9413)
9. Plan, draw, assemble and perform various domestic wiring. Carry out Testing, maintenance and repair/ replacement of domestic wiring. (NOS: PSS/N9414)
10. Carry out wiring of control panels, assemble accessories and equipment. (NOS: PSS/N1709)
11. Install, test and carry out maintenance of batteries and solar cell with due care and safety. (NOS: PSS/N6003)

12. Read and apply engineering drawing for different application in the field of work. (NOS: PSS/N9401)
13. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: PSS/N9402)

SECOND YEAR:

14. Plan, draw, install and test different types of Commercial wiring including advanced systems. Install temporary electrical wiring at construction site. (NOS: PSS/N1707)
15. Plan, draw, estimate material/ cost, install and test different types of industrial wiring system as per IE rules. Layout cables for various purposes including cable management. (NOS: PSS/N1707)
16. Plan, install and test illumination system including domestic, commercial and industrial requirements. Connect, program and operate PAR light on DMX controller (Stage light control). (NOS: PSS/N1707)
17. Assemble simple electronic circuits, repair CFL, LED lamps and DC regulated power supply. (NOS: PSS/N6002)
18. Assist in Installation and commissioning of small solar plant, solar pumps and construct Solar DC appliances. (NOS: PSS/N6003)
19. Plan, prepare and carry out jointing of LT/HT underground cables with due care and safety. (NOS: PSS/N2512)
20. Install Electric Vehicle charging stations and carry out preventive/breakdown maintenance. (NOS: PSS/N9410)
21. Install and repair domestic appliances viz., electric kettle, food processor, fan, washing machine, geyser, water pump etc. including repair of electrical faults in refrigerator, window and split AC. (NOS: PSS/N6003, PSS/N4402, PSS/N1711)
22. Perform winding of small transformers and motors viz., ceiling fan, table fan, mixer/grinder, submersible pump, etc. (NOS: PSS/N4402)
23. Carry out Estimation & costing for different wiring systems and ready to adopt structured / smart wiring concept for automation and IoT applications. (NOS: PSS/N9413)
24. Read and apply engineering drawing for different application in the field of work. (NOS: PSS/N9401)
25. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: PSS/N9402)

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
First Year	
1. Apply safety precautions and prepare profile with an appropriate accuracy as per drawing using basic jobs of marking components, filing, drilling, riveting, fitting, joining etc. (NOS: PSS/N1707)	Identify trade tools and equipment; demonstrate their uses with safety, care & maintenance.
	Identify safety symbols and hazards.
	Procedure of fire fighting in case of electrical fire.
	Make a wooden switchboard.
	Prepare a closed cabinet from metal sheet with holes for cables and various fittings.
2. Prepare terminations, make good quality of electrical wire joints for single and multi-strand conductors and carry out crimping, soldering and brazing. (NOS: PSS/N2512, PSS/N1331)	Identify types of wires, cables and their specifications.
	Measure size of the wire using SWG /micrometer.
	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.
	Prepare Rat tail/ Duplex cross/ Knotted type/ fixture Joints in bare conductor.
	Solder the finished copper conductor joints with precaution.
	Prepare termination of cable lugs by using crimping tool.
	Demonstrate joining of metals by brazing.
3. Draw and set up DC and AC circuits, involving R-L-C	Measure resistance using voltage drop/Wheatstone bridge method.

components, perform measurement of various electrical parameters with due care and safety. Carry out Sealing of energy meters and Monitor meter readings using MRI. (NOS: PSS/N1707)	Measure current and voltage in electrical circuits and verify Kirchhoff's Law.
	Verify the characteristics of series-parallel combination of resistors.
	Wind a solenoid, determine the poles and plot the field of a magnet bar.
	Demonstrate generation of mutually induced emf.
	Measure current, voltage, power factor and determine the characteristics of RL/ RC / RLC in AC series / parallel circuits.
	Measure power, energy for lagging / leading power factors in single phase / three phase circuits.
	Demonstrate improvement of PF by use of capacitors in AC three phase circuits.
	Find the phase sequence of 3-phase supply using phase sequence meter.
	Measure the Power of three phase circuit for balanced and unbalanced loads
	Measure Power/ Energy/ Frequency/Current using Wattmeter/ Energy meter / Frequency/ Tong tester meter in single and three phase circuits.
	Use analog /digital multi-meter for measurement of different electrical parameters.
	Explain installation and sealing of energy meters and readings using MRI.
4. Explain basic concepts of generation, transmission and distribution of electrical power including renewable energy. (NOS: PSS/N7001)	Make a block diagram of Thermal /Solar/ wind/ small, mini & micro hydro power plants/ Nuclear power plants.
	Make line diagram of transmission and distribution systems.
	Identify major equipment used in different substations viz., outdoor, indoor, pole mounted, etc.
	Prepare a line diagram of the institute/ ITI supply system.
5. Plan and prepare Plate and Pipe earthing installations and ensure safe and effective earthing. (NOS: PSS/N6002)	Identify various components of different earthing system.
	Measure earth resistance by earth tester/ megger.
	Perform grounding of equipment and systems.
	Test earth leakage by ELCB and relay.

6. Carry out wiring, testing, and maintenance of DC machines including DC motor starters.	Identify parts of DC machines/ DC motor starters and their terminals.
	Carry out wiring of given DC motor / generator.
	Explain Service and repair of three point / four-point DC motor starters.
	Perform maintenance of carbon brushes, brush holders, Commutator and slip-rings.
	Perform speed control of DC motors - field / armature control method.
	Demonstrate overhauling/ routine maintenance of DC machines.
7. Carry out wiring, testing, and maintenance of small transformers, 1ϕ & 3ϕ AC motors and Alternators including AC motor starters.	Identify terminals, components of single phase / three phase transformers and carry out wiring.
	Carry out polarity/ insulation/ open circuit/ short circuit test /voltage regulation of a transformer.
	Identify parts and terminals of single phase / three phase AC motors, test for continuity / insulation resistance.
	Identify parts and terminals of MG set and make connections.
	Identify parts and service of AC motor starters DOL/ star-delta/ auto-transformer /rotor resistance starter.
8. Read, understand and draw electrical Schematic drawings of power and control circuits using industry standard symbols.	Draw symbols used in the electrical circuit drawings.
	Interpret control and power circuits of given wiring drawings.
	Draw circuit for control of lamps/ tube lights/ fans / single phase motors.
	Draw a circuit of fully automatic star-delta starter for starting a 3-ϕ induction motor.
9. Plan, draw, assemble and perform various domestic wiring. Carry out Testing, maintenance and repair/ replacement of domestic wiring.	Calculate maximum connected load in a section of the institute.
	Draw electrical supply system from pole to main switch board.
	Wire up PVC Casing-capping wiring to control one lamp from two different places (Staircase wiring).
	Wire up PVC conduit wiring to control one lamp from three different places.
	Prepare main distribution board, mount the energy meter

	board.
	Wire up the consumers main board with ICDP switch and distribution fuse box.
	Carry out earth continuity test.
	Check line-earth and neutral-earth loop impedance.
	Tracing of simulated faults in given circuit.
10. Carry out wiring of control panels, assemble accessories and equipment.	Carry out wiring of Electrical panel, mount various control elements and secure the cables properly.
	Explain electro-magnetic interference and electro-magnetic compatibility.
	Perform wiring of control panel for different operations/controls of motor using various accessories and test for its performance.
11. Install, test and carry out maintenance of batteries and solar cell with due care and safety. (NOS: PSS/N6003)	Carry out charging of a Lead acid cell/ filling of electrolytes, testing of charging/ checking of discharged and fully charged battery.
	Explain routine, care/ maintenance and testing of batteries.
	Identify different types of solar cell viz., a-Si, CdTe, c-Si, CI(G)S, CVP and HCVP, etc.
	Determine the number of solar cells in series/ parallel for given power requirement.
12. Read and apply engineering drawing for different application in the field of work.	Read & interpret the information on drawings and apply in executing practical work.
	Read &analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters.
	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
13. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the	Solve different mathematical problems
	Explain concept of basic science related to the field of study

field of study.	
SECOND YEAR	
14. Plan, draw, install and test different types of Commercial wiring including advanced systems. Install temporary electrical wiring at construction site. (NOS: PSS/N1707)	Carry out wiring for communication circuits and computer networks using UTP, STP, Co-axial and optical fibre cables.
	Wire-up lighting system for control using motion detector.
	Wire-up panel board for control of lights and fans from wireless remote.
	Install 1 ϕ / 3 ϕ online/ offline UPS wiring and test.
	Install and wire up CCTV camera.
	Install inverter and carry out wiring.
	Explain wiring planfor bathing area.
	Explain multi-storeyed building wiring.
	Install temporary LV electrical panels and lighting arrangements for construction site.
15. Plan, draw, estimate material/ cost, install and test different types of industrial wiring system as per IE rules. Layout cables for various purposes including cable management. (NOS: PSS/N1707)	Identify accessories and tools required for industrial wiring.
	Determine minimum ampacity and size of conductors for continuous and non-continuous loads.
	Demonstrate cutting, threading and bending of metallic conduit.
	Identify different bus bars, joining and installation including overhead bus bar system as per IE rules.
	Prepare bill of material, plan and practice wiring of an institute and workshop as per IE rules.
	Demonstrate split cable entry for multiple pre-terminated cables, up to IP 65 rated protection.
	Perform bonding and grounding of raceways, cable assembly and panels.
	Demonstrate use of earth rods. Explain testing of underground cables for faults and removing of the fault.
16. Plan, install and test illumination system including domestic, commercial and industrial requirements. Connect, program and operate PAR light on DMX controller	Prepare decorative lamp circuit to produce rotating/ running light effect.
	Install display spotlights and LED downlights, fluorescent tube.
	Explain/Demonstrate kitchen under-cabinet lighting, shelf lighting, closet lighting and cove lighting.
	Installl amps; HP mercury vapour / LP mercury vapour/ HP

(Stage light control). (NOS: PSS/N1707)	sodium vapour/ LP sodium vapour/ metal halide.
	Assemble and program DMX controller for operation of PAR lights.
17. Assemble simple electronic circuits, repair CFL, LED lamps and DC regulated power supply. (NOS: PSS/N6002)	Determine the value of resistance by colour code and identify types.
	Determine V-I characteristics of semiconductor diode.
	Identify circuit components and their terminals viz, diode, transistor, capacitors, regulator etc.
	Construct half wave/ full wave / bridge rectifier.
	Troubleshoot defects in simple power supplies.
	Identify different components and explain circuits of CFL & LED lamps.
	Perform repairing of LED / CFL.
18. Assist in Installation and commissioning of small solar plant, solar pumps and construct Solar DC appliances. (NOS: PSS/N6003)	Construct a solar lantern using Solar PV panel.
	Construct a Solar Day lighting using manual charge controller.
	Construct a Solar Street light using dusk to dawn charge controller.
	Construct a Solar water pump.
	Connect a Solar panel, Solar charge controller, Solar battery and a normal inverter and convert to a solar inverter.
	Prepare bill of material for a 1 KW solar PV installation.
	Explain synchronization between Solar Panel & AC grid supply.
19. Plan, prepare and carry out jointing of LT/HT underground cables with due care and safety. (NOS: PSS/N2512)	Identify different parts of various underground cables.
	Prepare cable for termination and joining.
	Explain discharging procedure of underground cables.
	Make straight joint of underground cable.
	Explain testing of underground cables.
20. Install Electric Vehicle charging stations and carry out preventive/breakdown maintenance.	Explain charger specifications.
	Install EV charging Station for public place.
	Install EV charging Station for home.
21. Install and repair domestic	Service and repair of bell/ buzzer/electric iron/ electric kettle.

appliances viz., electric kettle, food processor, fan, washing machine, geyser, water pump etc. including repair of electrical faults in refrigerator, window and split AC. (NOS: PSS/N6003, PSS/N4402, PSS/N1711)	Service and repair of cooking range / geyser/ mixer/grinder / food processor
	Service and repair of induction heater/ fan/ blower/ cooler.
	Service and repair of semi-automatic washing machine.
	Service and repair of refrigerator.
	Explain installation and repair of pump set and submersible pump.
	Carry out repair of electrical circuit of window and split AC.
22. Perform winding of small transformers and motors viz., ceiling fan, table fan, mixer/grinder, submersible pump, etc. (NOS: PSS/N4402)	Perform winding of single-phase transformer.
	Perform winding of ceiling fan / table fan motor.
	Carry out maintenance, service and repair of single-phase AC motors; mixer/grinder, table fan pumps etc.
	Carry out maintenance and servicing of universal motor.
	Carry out winding of submersible pump.
	Carry out winding of 3-ϕ AC motor.
23. Carry out Estimation & costing for different wiring systems and ready to adopt structured / smart wiring concept for automation and IoT applications.	Perform estimation and costing for different types/scheme of wiring for labour, materials and accessories for a given wiring layout.
24. Read and apply engineering drawing for different application in the field of work.	Read & interpret the information on drawings and apply in executing practical work.
	Read &analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters.
	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
25. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the	Solve different mathematical problems.
	Explain concept of basic science related to the field of study

field of study.	

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 110 Hrs; Professional Knowledge 20 Hrs	Apply safety precautions and prepare profile with an appropriate accuracy as per drawing using basic jobs of marking components, filing, drilling, riveting, fitting, joining etc. (Mapped NOS: PSS/N1707)	1. Visit various sections of the institutes and identify locations of different installations. (03 hrs) 2. Identify safety symbols and hazards. (04 hrs) 3. Practice elementary first aid. (04 hrs) 4. Practice safe methods of fire fighting in case of electrical fire. (04 hrs) 5. Demonstrate by visual aids to isolate electric supplies and rescue a person safely in contact with electricity. (7 hrs) 6. Demonstrate artificial respiration through visual aids. (04 hrs) 7. Identify trade tools and equipment. (03 hrs)	**Occupational Safety & Health:** Scope of the Wireman trade and career progression. Power sector scenario in India. Safety rules and safety signs for Danger, Warning, caution & personal safety messages. Basic injury prevention, Basic first aid, Hazard identification, avoidance and PPEs. Personal safety and factory safety. Effects of electric current on human being. Reasons for shock. Disposal procedure of waste materials. Response to emergencies e.g. power failure, fire, and system failure.

		8. Disposal procedure of waste materials. (03 hrs) 9. Use of personal protective equipment. (03 hrs) 10. Practice on filing and hacksawing and prepare T-joints, straight joints and dovetail joints on wooden blocks. (15 hrs) 11. Practice sawing, planing, drilling and assembling for making a wooden switchboard. (15 hrs) 12. Practice in marking and cutting of straight and curved pieces in metal sheets, making holes, securing by screw and riveting etc. (15 hrs) 13. Prepare a closed cabinet from metal sheet with holes for cables and various fittings. (15 hrs) 14. Workshop practice on drilling, chipping, internal and external threading of different sizes. (15 hrs)	Concept of Standards and advantages of BIS/ISI. Familiarization with signs and symbols of electrical accessories Introduction to 5S concept. Introduction to fitting tools, safety precautions. Description of files, hammers, chisels hacksaw frames, blades, their specification and grades. Marking tools description and use. Types of drills, description & drilling machines. Various wooden joints. Marking tools; calipers Dividers, Surface plates, angle plates, scribers, punches, surface gauges, Types, Uses, Care and maintenance. Sheet metal tools: Description of marking & cutting tools. Types of rivets and riveted joints. Use of thread gauge. Description of carpenter's tools Care and maintenance of tools. (20 hrs)
Professional Skill 60 Hrs; Professional Knowledge 10 Hrs	Prepare terminations, make good quality of electrical wire joints for single and multi-strand conductors and carry out crimping, soldering and brazing. (Mapped NOS: PSS/N2512, PSS/N1331)	15. Demonstrate and identify various types of cables used in domestic, commercial and industrial wiring systems. (9 hrs) 16. Practice stripping and skinning of different cables. Measure thickness of wire using SWG and micrometer. (9 hrs)	**Wire Joints:** Trade tools specifications. Properties of conductors, Fundamental of electricity. Electron theory; free electron, fundamental terms, definitions, units & effects of electric current. Types of wires & cables, standard wire gauge.

		17. Demonstrate and Practice bare conductor joints, viz. Rat tail, Duplex cross, Knotted type, Britannia, straight, Tee, Western union, fixture Joints, split bolt connector. (21 hrs) 18. Practice in soldering. (7 hrs) 19. Practice in brazing. (07 hrs) 20. Practice on crimping thimbles, lugs and fitting of a push fit co-axial plug and socket. (7 hrs)	Current carrying capacity of different conductors. Specification of wires & Cables- insulation & voltage grades -Low, medium & high voltage Precautions in using various types of cables / Ferrules. Types of Wire joints & their application. Insulators, semi-conductors and resistors. Voltage grading of different types of Insulators, permissible temperature rise. Solders, flux and soldering techniques. (10 hrs)
Professional Skill 130 Hrs; Professional Knowledge 30 Hrs	Draw and set up DC and AC circuits, involving R-L-C components, perform measurement of various electrical parameters with due care and safety. Carry out Sealing of energy meters and Monitor meter readings using MRI. (Mapped NOS: PSS/N1707)	21. Measure resistance using voltage drop method. (05 hrs) 22. Measure resistance using wheatstone bridge method. (06 hrs) 23. Verify thermal effect of electric current and change in resistance due to temperature. (06 hrs) 24. Verify Ohm's law in electrical circuit. (05 hrs) 25. Measure current and voltage in electrical circuits to verify Kirchhoff's Law. (9 hrs) 26. Verify the characteristics of series-parallel combination of resistors. (05 hrs) 27. Determine the poles and plot the field of a magnet bar. (05 hrs)	**Basic Electricity:** Introduction of National Electrical Code 2011. Ohm's Law, Kirchoff's Laws Series and parallel circuits. Open and short circuits in series and parallel networks. Laws of Resistance and various types of resistors. Series and parallel combinations of resistors. Wheatstone bridge; principle and its applications. Different methods of measuring the values of resistance. **Magnetism**; Magnetic terms, magnetic materials and properties of magnet. Principles and laws of electro-magnetism.

		28. Wind a solenoid and determine the magnetic effect of electric current. (05 hrs) 29. Demonstrate generation of mutually induced emf. (05 hrs) 30. Identify various types of capacitors, charging / discharging and testing. Group the given capacitors to get the required capacity and voltage rating. (06 hrs) 31. Measure power, energy for lagging and leading power factors in three phase circuits. Verify relationship between line and phase values in 3 phase star and delta connection. (12 hrs) 32. Ascertain use of neutral by identifying wires of a 3-phase 4 wire system and find the phase sequence using phase sequence meter. (05 hrs) 33. Practice on using analog and digital multi-meter for measurement of various parameters. (05 hrs) 34. Determine the effect of broken neutral wire in three phase four wire system. (05 hrs) 35. Measure the Power of three phase circuit for balanced and unbalanced loads. (05 hrs) 36. Practice on measuring instruments in single and three phase circuits viz.,	Self and mutually induced EMFs. **Electrostatics:** Capacitor- Different types, functions, grouping and uses. Inductive and capacitive reactance, their effect on AC circuit and related vector concepts. Comparison and Advantages of DC and AC systems. Related terms frequency, Instantaneous value, R.M.S. value, Average value, Peak factor, form factor, power factor and Impedance etc. Sine wave, phase and phase difference. Active and Reactive power. Single Phase and three-phase system. Advantages of AC poly-phase system. Problems on A.C. circuits. Concept of three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load. **Measuring instruments;** Classification of electrical instruments and essential forces required in indicating instruments. PMMC and Moving iron instruments.

		Wattmeter, Energy meter, Phase sequence meter and Frequency meter. (08 hrs) 37. Demonstrate improvement of PF by use of capacitors in AC three phase circuits. (06 hrs) 38. Measure current, voltage, power factor and determine the characteristics of RL, RC and RLC in AC series and parallel circuits. (12 hrs) 39. Measure electrical parameters using tong tester in three phase circuits. (05 hrs) 40. Practice installation and sealing of energy meters. (05 hrs) 41. Practice on collecting meter reading of various meters using MRI and study of MRI reports. (05 hrs)	Measurement of various electrical parameters using different analog and digital instruments viz., multi-meter, Wattmeter, Energy meter, Phase sequence meter, Frequency meter, etc. Measurement of energy in three phase circuit. Important common applicable IE rules. **Meter Reading;** - Description of MRI - Reading of Meter by MRI (30 hrs)
Professional Skill 50 Hrs; Professional Knowledge 10 Hrs	Explain basic concepts of generation, transmission and distribution of electrical power including renewable energy. (Mapped NOS: PSS/N7001)	42. Demonstrate Thermal & Nuclear power plants using visual aids. (05 hrs) 43. Demonstrate different transmission and distribution systems using visual aids. (06 hrs.) 44. Demonstrate different renewable energy power plants viz., Solar, wind, small, mini &micro hydro power plants using visual aids. (06 hrs.)	**Power system:** Generation, transmission and distribution of electrical power General idea about overhead transmission, distribution (LV, MV & HV) and their types and accessories used. Types of Distribution system Line protecting devices Types of substations - indoor, outdoor & Pole mounted, etc. **Substation Equipment** Switchgear; CBs – ACB, VCB, SF6, OCB etc. protection schemes,

		45. Identify different types of insulators. (Video demonstration/ charts). (03 hrs) 46. Visit to distribution sub-station to familiarize with equipment and various accessories. (08 Hrs) 47. Demonstrate operation of various circuit breakers viz., ACB, VCB, SF6, OCB. using visual aids. (10 hrs.) 48. Demonstrate different types of substations viz., outdoor, indoor, pole mounted. using visual aids. (06 hrs.) 49. Prepare a line diagram of the institute/ ITI supply system. (06 hrs.)	current transformer, Potential transformer, Protective relays, lightning arrestors, Different types of switches and switch gears, multi Range switches, rotary switches, cooker control panels, power circuit switches, thermostat, mercury switches etc. (10 hrs)
Professional Skill 40 Hrs; Professional Knowledge 7 Hrs	Plan and prepare Plate and Pipe earthing installations and ensure safe and effective earthing. (Mapped NOS: PSS/N6002)	50. Demonstrate and identify various components of earthing installation. (05 hrs) 51. Prepare pipe earthing and measure earth resistance by earth tester/ megger. (9 Hrs) 52. Prepare plate earthing and measure earth resistance by earth tester/ megger. (9 Hrs) 53. Demonstrate grid/ mesh earthing. (06 Hrs) 54. Practice grounding of equipment and systems. (06 Hrs) 55. Test earth leakage by ELCB and relay. (05 Hrs)	**Earthing:** Importance of Earthing. I. E. Rules for earthing conduits using earth clips and earth wire as per IS 732-1863. Plate earthing, pipe earthing grid/mesh earthing. Earth resistance, earth leakage current and circuit breaker. Difference between grounding and earthing. Awareness of circuit main earth (CME) and portable earth. (07 hrs)

Professional Skill 50 Hrs; Professional Knowledge 10 Hrs	Carry out wiring, testing, and maintenance of DC machines including DC motor starters.	56. Identify parts of DC machines and their terminals. (04 Hrs.) 57. Carry out wiring of different DC motors and generators. (8 Hrs.) 58. Dismantle and identify parts of three point and four-point DC motor starters. (05 Hrs.) 59. Assemble, Service and repair three point and four-point DC motor starters. (9 Hrs.) 60. Practice maintenance of carbon brushes, brush holders, Commutator and slip-rings. (9 Hrs.) 61. Perform speed control of DC motors - field and armature control method. (06 Hrs.) 62. Demonstrate overhauling/ routine maintenance of DC machines. (9 Hrs.)	**DC Machines;** General concept of rotating electrical machines. Principle of DC generator. Use of Armature, Field Coil, Polarity, Yoke, Cooling Fan, Commutator, slip ring and Brushes, Laminated core etc. E.M.F. equation Separately excited and self-excited generators. Series, shunt and compound generators. Armature reaction, Commutation, interpoles and connection of interpoles. Parallel Operation of DC Generators. Application, losses & efficiency of DC Generators. Principle and types of DC motors. Changing the direction of rotation. Methods of speed control of DC motors. (10 hrs)
Professional Skill 60 Hrs; Professional Knowledge 10 Hrs	Carry out wiring, testing, and maintenance of small transformers, 1ϕ& 3ϕ AC motors and Alternators including AC motor starters.	63. Verify terminals, identify components of various single phase and three phase transformers and carry out wiring. (05 hrs) 64. Carry out polarity, insulation, open circuit, short circuit test and voltage regulation of a transformer. (10 hrs) 65. Identify parts and terminals of three phase AC motors, test for continuity and	**Transformers, AC motors, starters and Alternators:** Working principle, construction and classification of transformers. Single phase and three phase transformers. Testing of transformers. General concept of rotating electrical machines. Principle of operation of AC motors and generators,

		insulation resistance. (10 hrs) 66. Identify parts and terminals of different types of single-phase AC motors. (10 hrs) 67. Identify parts and terminals of MG set, make connections and demonstrate conversion of electrical power to a different form. (10 Hrs) 68. Identify parts, service and troubleshoot/ repair & maintenance of AC motor starters viz., DOL, star-delta auto-transformer and rotor resistance starter. (15 Hrs)	components and various types. **Motor Starters:** Different types of starters for AC motors, its necessity, basic contactor circuit, parts and their functions. Basic knowledge of soft starter. (10 hrs)
Professional Skill 50 Hrs; Professional Knowledge 10 Hrs	Read, understand and draw electrical Schematic drawings of power and control circuits using industry standard symbols.	69. Identify and draw symbols used in the electrical circuit drawings. (08 hrs) 70. Interpret control and power circuits of various panel wiring drawings in simple to complex manner. (10 hrs) 71. Practice drawing of simple circuits viz. control of lamps, tube lights, fans and single - phase motors. (10 hrs) 72. Practice drawing of circuits using various control elements viz. timers, relays Circuit breakers, sensors, and sequential control of motors. (17 hrs) 73. Draw a circuit of fully automatic star-delta starter for starting a 3-ϕ induction motor. (05 hrs)	Different control elements and equipment, their symbols. Power and control schematic drawings with interlocks. Relay ladder logic. Relay and control panel wiring. Circuits of various electrical appliances and controls. Power Distribution network drawings. (10 hrs)
Professional Skill 175	Plan, draw, assemble and perform various	74. Wire up simple circuits and practice control of lamps in	**Domestic Wiring:** Introduction and explanation of

Hrs; Professional Knowledge 35 Hrs	domestic wiring. Carry out Testing, maintenance and repair/ replacement of domestic wiring.	different combinations using switching concept. (10 Hrs) 75. Calculate maximum connected load in a section of the institute. (10 hrs) 76. Demonstrate and draw electrical supply system from pole to main switch board including different components. (05 hrs.) 77. Prepare a list of typical energy consumption of electrical appliances. (05 hrs) 78. Identify various accessories used in domestic wiring of different ratings/sizes and list out their approximate cost. (10 hrs.) 79. Prepare test boards/ extension boards and mount accessories like lamp holders, switches, sockets, fuses, relays, MCB, ELCB, MCCB. (18 Hrs) 80. Graphical representation (Current Vs time) of MCB & ELCB. (05 hrs) 81. Demonstrate method of working with plum bob, sprit level, water level and wall chasing. (10 hrs) 82. Draw layouts and practice PVC Casing-capping wiring of minimum 20 meter length with minimum to more number of points. (12 Hrs) 83. Wire up PVC Casing-capping wiring to control one lamp	electrical wiring systems, cleat wiring, Casing-capping, CTS, Conduit and concealed etc. IE Rules related to wiring, National Building codes for house wiring, specification and types, rating & material. Minimum load capacities (W/m^2) of various buildings. Electrical load categories. Terms; Maximum demand, Load factor and Diversity factor, etc. Various wiring accessories/ electrical fittings e.g. switches, fuses, lamp holders, plugs, brackets, ceiling rose, cut out relays, sensors, voltage regulators, MCB, ELCB, MCCB etc. Grading of cables and current ratings. Principle of laying out of domestic wiring. Selection of switchgear. Voltage drop concept. IS 732-1863. Wiring materials used for PVC cables, Indian standards regarding the above wiring such as clip distance fixing of screws, cable bending etc. Introduction to estimation procedure, PVC casing and capping materials, sizes and

		from two different places (Staircase wiring). (12 Hrs) 84. Draw layouts and practice PVC Conduit wiring of minimum 20 mtr length with minimum to more number of points. (15 hrs) 85. Wire up PVC conduit wiring to control one lamp from three different places. (12 hrs) 86. Demonstrate process of concealed conduit wiring system using visual aids. (05 hrs) 87. Prepare main distribution board, mount the energy meter board. (10 hrs) 88. Wire up the consumers main board with ICDP switch and distribution fuse box. (05 Hrs) 89. Carry out polarity test and ensure correct connections of switches, fuses and accessories. (05 hrs) 90. Carry out earth continuity test and ensure resistance of earth conductor as per IE rule. (05 hrs) 91. Check line-earth and neutral-earth loop impedance and ensure effectiveness of earthing. (06 hrs) 92. Simulate faults and practice tracing of faults in different circuits. (10 Hrs)	grades etc. Conduit pipe wiring materials and accessories, types and sizes of conduit. Branching of circuits with respect to loads such as lighting and power. Layout of Light points, fan points, heating loads etc., their controls, main switches, distribution boards as per IE rules. Difference between MCCB, MCB, ELCB, RCCB, MPCB. Different types of wiring; PVC conduit; Surface and concealed (PVC Conduit;/ metal conduit) Casing-capping wiring system. Power, control, Communication and entertainment wiring. Wiring circuits planning, permissible load in sub-circuit and main circuit. (35 hrs)

		93. Video demonstration of various wiring accessories/ electrical fittings available in the market viz., switches, panels, fuses, plugs, brackets, cut out relays, sensors, voltage regulators, circuit breakers etc. (05 hrs)	
Professional Skill 80 Hrs; Professional Knowledge 18 Hrs	Carry out wiring of control panels, assemble accessories and equipment. (Mapped NOS: PSS/N1709)	94. Demonstrate various components of a control panel viz. DIN rails, plastic trunking, connector blocks, screw terminals, transformers/ toroidal inductors, resistors, capacitors, fuses, fuse holders, switches, push buttons, lamps their specifications and labelling. (05 hrs) 95. Demonstrate various components of different relays and contactors, their specifications, fittings in the control panel and labelling. (05 hrs) 96. Practice cable forming including template, binding, lacing, loop tie, lock stitch, breakouts, twisted pair. (10 hrs) 97. Practice use of sleeves, bootlace ferrule, passing cables through strain relief plate, correct method of connections in terminal blocks and routing of cables. (10 hrs)	**Control Panel Wiring;** Control panel components; DIN rails, trunking, connector blocks, screw terminals, relays, contactors, protective units, fuses, fuse holders; chassis mounted, fuse-links, resistors; fixed, variable, capacitors, switches, lamps, labelling grommets and clips etc. Cable forming; template, wiring schedule, run out sheet, binding, continuous lacing, loop tie, lock stitch, finish knot, breakouts, lacing breakouts, spot ties, laying of wires, twisted pair, Cable markers and colour codes etc. Connections and routing of cables. Consideration of EMI/EMC Conductors of different circuits. Symbols and use of relay contacts: NO, NC, changeover, make/break after delay. Testing of various control elements and circuits. (18 hrs)

		98. Pass cables through strain relief plate in an Electrical cabinet and secure the cables properly using cable tie/clamp. (05 hrs) 99. Mount various control elements e.g. circuit breakers, relays, contactors, measuring instruments, sensors and timers. (10 hrs) 100. Practice earthing and screening of cabinets as per IE rules and ensure proper earth continuity. (10 hrs) 101. Demonstrate electro-magnetic interference and electro-magnetic compatibility. (05 hrs) 102. Practice wiring of control panel for different operations/controls of motor using various accessories and test for its performance. (20 hrs)	
Professional Skill 35 Hrs; Professional Knowledge 10 Hrs	Install, test and carry out maintenance of batteries and solar cell with due care and safety. (Mapped NOS: PSS/N6003)	103. Demonstrate use of various types of cells and practice on grouping of cells for specified voltage/current under different conditions. (03 Hrs) 104. Prepare and practice on battery charging. (03 Hrs) 105. Practice on routine, care/ maintenance and testing of batteries. (07 Hrs) 106. Practice charging of a Lead acid cell, filling of electrolytes, testing of	**Battery and solar cell:** Chemical effects of electric current and Laws of electrolysis. Explanation of Anodes and cathodes. Types of cells, advantages/ disadvantages and their applications. Lead acid cell; Principle of operation and components. Types of battery charging, Safety precautions, test equipment and

		charging, checking of discharged and fully charged battery. (12 hrs) 107. Demonstrate different types of solar cell viz., a-Si, Cd-Te, c-Si, CI(G)S, CVP and HCVP. (05 hrs) 108. Determine the number of solar cells in series/ parallel for given power requirement. (05 Hrs)	maintenance. Grouping of cells for specified voltage and current. Principle and operation of solar cell, Types of solar cell. (10 Hrs)
Engineering Drawing: 40 Hrs.			
Professional Knowledge ED-40 Hrs.	Read and apply engineering drawing for different application in the field of work.	**<u>Engineering Drawing:</u>** Introduction to Engineering Drawing and Drawing Instruments– • Conventions • Sizes and layout of drawing sheets • Title Block, its position and content • Drawing Instrument Freehand drawing of– • Geometrical figures and blocks with dimension • Transferring measurement from the given object to the free hand sketches. • Free hand drawing of hand tools. Drawing of Geometrical figures: • Angle, Triangle, Circle, Rectangle, Square, Parallelogram. • Lettering & Numbering – Single Stroke Dimensioning Practice • Types of arrowhead Symbolic representation– • Different electrical symbols used in the related trades	

		Reading of Electrical Circuit Diagram Reading of Electrical Layout drawing	
Workshop Calculation & Science: 30 Hrs.			
Professional Knowledge WCS-30 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	**<u>Workshop Calculation & Science:</u>** **Unit, Fractions** Classification of unit system Fundamental and Derived units F.P.S, C.G.S, M.K.S and SI units Measurement units and conversion Factors, HCF, LCM and problems Fractions - Addition, subtraction, multiplication & division Decimal fractions - Addition, subtraction, multiplication& division Solving problems by using calculator **Square root, Ratio and Proportions, Percentage** Square and square root Simple problems using calculator Applications of Pythagoras theorem and related problems Ratio and proportion Ratio and proportion - Direct and indirect proportions Percentage Percentage - Changing percentage to decimal and fraction **Material Science** Types metals, types of ferrous and non-ferrous metals Introduction of iron and cast iron **Mass, Weight, Volume and Density** Mass, volume, density, weight Related problems for mass, volume, density, weight Work, power, energy, HP, IHP, BHP and efficiency Potential energy, kinetic energy and related problems with assignment **Heat & Temperature and Pressure** Concept of heat and temperature, effects of heat, difference between heat and temperature, boiling point & melting point of different metals and non-metals Scales of temperature, Celsius, Fahrenheit, kelvin and conversion between scales of temperature Heat &Temperature - Temperature measuring instruments, types of thermometer, pyrometer and transmission of heat - Conduction, convection and radiation. **Mensuration** Area and perimeter of square, rectangle and parallelogram Area and perimeter of Triangles	

		Area and perimeter of circle, semi-circle, circular ring, sector of circle, hexagon and ellipse Surface area and volume of solids - cube, cuboid, cylinder, sphere and hollow cylinder **Trigonometry** Measurement of angles Trigonometrical ratios Trigonometrical tables
Project Work / Industrial Visit		

SYLLABUS FOR WIREMAN TRADE			
SECOND YEAR			
Duration	**Reference Learning Outcomes**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 115 Hrs; Professional Knowledge 30 Hrs	Plan, draw, install and test different types of Commercial wiring including advanced systems. Install temporary electrical wiring at construction site. (Mapped NOS: PSS/N1707)	109. Practice wiring for communication circuits and computer networks using UTP, STP, Co-axial and optical fibre cables. (11 hrs) 110. Wire-up lighting system for control using motion detector. (12 hrs) 111. Wire-up panel board for control of lights and fans from wireless remote. (12	**Commercial Wiring:** Wiring in commercial building- their special precautions as per I.E. rules. Different types of wiring - Power, control, Communication and entertainment wiring. Wiring circuits planning, Cabling in healthcare facilities;

		hrs) 112. Demonstrate wiring and components of fire alarm system, interior siren, control & signalling using visual aids. (12 hrs) 113. Practice installation of 1 ϕ & 3 ϕ online/ offline UPS wiring and test. (12 hrs) 114. Install and wire up CCTV camera. (08 hrs) 115. Install inverter and carry out wiring. (12 hrs) 116. Demonstrate wiring plan, lighting fixtures, receptacles and sensors for bathing area. (12 hrs) 117. Demonstrate multi-storeyed building wiring. (12 hrs) 118. Install temporary LV electrical panels and lighting arrangements for construction site. (12 hrs)	importance of grounding, shielding and routing in accordance with life safety codes to minimize interference with medical equipment. GFCI (Ground-fault circuit interrupter) receptacles. (30 hrs)
Professional Skill 110 Hrs; Professional Knowledge 28 Hrs	Plan, draw, estimate material/ cost, install and test different types of industrial wiring system as per IE rules. Layout cables for various purposes including cable management. (Mapped NOS: PSS/N1707)	119. Identify accessories and tools required for industrial wiring. Demonstrate various switchboards, switchgears, industrial control panels and accessories. (06 hrs) 120. Demonstrate cable tray, raceways, auxiliary gutter, cable bus assembly, trench for passing of cables. (06 hrs) 121. Determine minimum ampacity and size of conductors for continuous	**Industrial Wiring:** Adverse conditions likely to affect the installation. Degree of mechanical and electrical protection necessary. Peak-Non-peak Loads in Office Buildings Lighting Design; lighting power density, Estimation of load, cable size,

		and non-continuous loads. (06 hrs) 122. Practice installing cables in conduit as per IE rules. (06 hrs) 123. Practice cutting, threading and bending of metallic conduit. (08 hrs) 124. Identify different bus bars, practice joining and installation including overhead bus bar system as per IE rules. (10 hrs) 125. Prepare bill of material, plan and practice wiring of an institute and workshop as per IE rules. (16 hrs) 126. Demonstrate Hospital, Tunnel and Godown wiring using visual aids. (06 hrs) 127. Practice testing / fault detection of industrial wiring installations and repair. (14 hrs) 128. Practice laying of cables in raceways and trenches. (05 hrs) 129. Demonstrate various cable glands. Practice cable entry on a switch cabinet wall. (05 hrs) 130. Practice passing of cables through cable entry plate for standard cables without connectors, up to IP 68 rated protection. (05 hrs) 131. Practice split cable entry for multiple pre-terminated	bill of material and cost. Inspection and testing of wiring installations. Special wiring circuit e.g. hospital, godown, tunnel and workshop, etc. Danger notice as per IE rules **Cable Management:** Types of cables, their use, Various cable glands Introduction to IP ratings (Ingress protection) and IP Codes format. Importance of Bonding and grounding, various types. Testing of cables, locating faults, open circuit, short circuit and leakage in cables. (28 hrs)

		cables, up to IP 65 rated protection. (05 hrs) 132. Demonstrate bonding and grounding of raceways, cable assembly and panels. (04 hrs) 133. Demonstrate use of earth rods. Test underground cables for faults and remove the fault. (08 hrs)	
Professional Skill 60 Hrs; Professional Knowledge 20 Hrs	Plan, install and test illumination system including domestic, commercial and industrial requirements. Connect, program and operate PAR light on DMX controller (Stage light control). (NOS: PSS/N1707)	134. Group different wattage of lamps in series for specified voltage. (03 Hrs) 135. Practice on low voltage track system, mains voltage track system and LED battery powered lighting. (07 hrs) 136. Prepare decorative lamp circuit to produce rotating/ running light effect. (08 Hrs) 137. Install different display spotlights and LED downlights. (08 Hrs) 138. Demonstrate kitchen under-cabinet lighting, shelf lighting, closet lighting and cove lighting. (05 hrs) 139. Practice installation of various lamps e.g. fluorescent tube, HP mercury vapour, LP mercury vapour, HP sodium vapour, LP sodium vapour, metal halide, LED lights, pendant lighting. (15 hrs) 140. Assemble, program and Practice on DMX controller for operation of PAR lights.	**Illumination & Stage Light Control:** Laws of Illuminations. Types of illumination system. Illumination factors, intensity of light. Type of lamps, advantages/ disadvantages and their applications. Calculations of lumens and efficiency. Spotlights, downlights, Strip lights Various reflectors; PAR (Parabolic aluminized reflector), MR (Multi-faceted reflector) LED video wall panel applications. (20 hrs)

		(10 hrs) 141. Visual demonstration of LED video wall panel installation, hardware & software setup. (04 hrs)	
Professional Skill 65 Hrs; Professional Knowledge 20 Hrs	Assemble simple electronic circuits, repair CFL, LED lamps and DC regulated power supply. (Mapped NOS: PSS/N6002)	142. Determine the value of resistance by colour code and identify types. (05 hrs) 143. Determine V-I characteristics of semiconductor diode. (05 hrs) 144. Identify circuit components and their terminals viz, diode, transistor, capacitors, regulator. (06 hrs) 145. Construct half wave, full wave and bridge rectifiers. (15 hrs) 146. Practice soldering on basic electrical and electronic circuits. (06 hrs) 147. Troubleshoot defects in simple power supplies. (05 hrs) 148. Identify different components and circuits of CFL & LED lamps. (08 hrs) 149. Check faulty section/ components of LED & CFL and practice for repairing. (15 hrs)	**CFL/LED Lamps & DC regulated power supply;** Resistors; colour code, types and characteristics. Diode; P-N junction, classification, specifications, biasing and characteristics. Rectifier circuit; half wave, full wave, bridge rectifiers and filters. Active and passive components. Functioning of components used in CFL and LED circuits. CFL and LED lamp's circuit. Safety and disposal procedure (20 hrs)
Professional Skill 80 Hrs; Professional Knowledge	Assist in Installation and commissioning of small solar plant, solar pumps and construct	150. Construct a solar lantern using Solar PV panel (15W), Charge controller (6V, 5A), output control circuit for variable illumination,	**Solar Power Plant:** Solar energy fundamentals. Study of Sun path (east to west, North to south and south to north movement).

20 Hrs	Solar DC appliances. (Mapped NOS: PSS/N6003)	Rechargeable battery (6V, 7Ah) and DC LED lamp (5W). (15 hrs) 151. Construct a Solar Day lighting using manual charge controller (12V, 10A), Solar battery (12V, 100Ah), Solar panel (75 W) and 4X LED light (12V DC, 5W). (10 hrs) 152. Construct a Solar Street light using dusk to dawn charge controller (12V, 10 A), Solar battery (12V, 100 Ah), Solar panel (75 W) and 4X LED light (12V DC, 5W). (10 hrs) 153. Construct a Solar water pump using a DC pump (24 V), Solar Panel (250 W), Charge controller (24 V, 10 A). (12 hrs) 154. Connect a Solar panel (10W), Solar charge controller (12V, 10A), Solar battery (12V, 100 Ah) and a normal inverter and convert to a solar inverter. (10 hrs) 155. Prepare bill of material for a 1 KW solar PV installation. (10 hrs) 156. Demonstrate through audio visual aids; automatic manufacturing of solar panels, installation of solar street light, solar fertilizer sprayer, solar water pump and solar traffic light. (09	Study of daily and seasonal changes of sunlight. Angle of inclination of radiant light and its relation with latitude and longitude of different locations on Earth. Solar DC domestic application: Making of solar lantern. Solar Day lighting. Solar Garden Lights. Safety in DC system. Quality standards List out the inventory list of equipments. Solar DC industrial application: Solar street light. Solar home lighting system. Solar Security system. Solar DC water pump. Differentiate AC and DC solar pumps and their PV requirements for various HP capacities. Solar PV e-learning software. (20 hrs)

		hrs) 157. Demonstrate synchronization between Solar Panel & AC grid supply using visual aids. (04 hrs)	
Professional Skill 85 Hrs; Professional Knowledge 20 Hrs	Plan, prepare and carry out jointing of LT/HT underground cables with due care and safety. (Mapped NOS: PSS/N2512)	158. Identify different parts of various underground cables. (05 hrs) 159. Practice preparation of cables for termination and joining. (12 hrs) 160. Demonstrate termination kits and practice on terminations of LT/HT cables. (15 hrs) 161. Practice discharging procedure of underground cables. (08 hrs) 162. Make straight joint of different types of underground cable. (25 hrs) 163. Demonstrate jointing of XLPE cables using audio-visual aids. (12 hrs) 164. Demonstrate various tests on underground cables. (08 hrs)	**Underground cable joints**: Need of cables, advantages and disadvantages, various types viz., PVC, XLPE, PILC, oil filled, etc. Cable insulation & voltage grades. Joints and terminations; pre-moulded, heat shrinkable, extrusion molded joints Slip on, cold shrink terminations. Types of connectors used in the cable, current path. Methods of conductor connection, contact resistance. Galvanic corrosion and use of bimetals. Connectivity for cable screen and armour, mechanical protection Kits for joints and terminations. Cable termination to equipment Standards and testing; type, routine, field test, Stress control (20 hrs)
Professional Skill 20 Hrs; Professional Knowledge 05 Hrs	Install Electric Vehicle charging stations and carry out preventive/breakdown maintenance.	165. Demonstrate different charger specifications. (04hrs) 166. Perform installation of EV charging Station for Public places. (08 hrs) 167. Perform installation of Home EV charging stations.	EV scenario in India and EV Charging basic theory. EV Charging safety requirements. (05 hrs)

		(08 hrs)	
Professional Skill 135 Hrs; Professional Knowledge 40 Hrs	Install and repair domestic appliances viz., electric kettle, food processor, fan, washing machine, geyser, water pump etc. including repair of electrical faults in refrigerator, window and split AC. (Mapped NOS: PSS/N6003, PSS/N4402, PSS/N1711)	168. Service and repair of bell/ buzzer. (06 hrs) 169. Service and repair of electric iron, electric kettle, cooking range and geyser. (15 hrs) 170. Service and repair of induction heater. (06 hrs) 171. Service and repair of mixer/grinder and food processor. (20 hrs) 172. Service and repair of fan, blower, cooler, etc. (15 hrs) 173. Service and repair of semi-automatic washing machine. Demonstrate components of fully automatic top & front load washing machine using visual aids. (15 hrs) 174. Service and repair of refrigerator. (15 hrs) 175. Demonstrate installation and repair of pump set and submersible pump. (15 hrs) 176. Carry out repair of electrical circuit of window and split AC. (20 hrs) 177. Demonstrate installation and maintenance of split AC using visual aids. (08 hrs)	**Domestic appliances:** Working principles and circuits of common domestic electrical appliances; Bell, buzzer, electric iron, kettle, cooking range, geyser, induction heater, mixer, grinder, juicer, food processor, fan, pump set, washing machine, refrigerator and air conditioner etc. Concept of Neutral and Earth. (40 hrs)
Professional Skill 130 Hrs; Professional Knowledge	Perform winding of small transformers and motors viz., ceiling fan, table fan, mixer/grinder, submersible pump,	178. Practice winding of single-phase transformer. (12 hrs) 179. Practice on ceiling fan and table fan motor winding. (12 hrs) 180. Carry out maintenance,	**Winding:** Concentric/ distributed, single/ double layer winding and related terms. Troubleshooting of single-phase

35 Hrs	etc. (Mapped NOS: PSS/N4402)	service and repair of single-phase AC motors viz., mixer/grinder, table fan pumps etc. (25 hrs) 181. Practice on single/double layer and concentric winding for AC motors and testing. (30 hrs) 182. Carry out maintenance and servicing of universal motor. (12 hrs) 183. Carry out winding of submersible pump. (15 hrs) 184. Practice winding of small 3-ϕ AC motor. (24 hrs)	AC induction motors and universal motor. (35 hrs)
Professional Skill 40 Hrs; Professional Knowledge 10 Hrs	Carry out Estimation & costing for different wiring systems and ready to adopt structured / smart wiring concept for automation and IoT applications.	185. Perform estimation and costing for different types/scheme of wiring for labour, materials and accessories as per layout. (25 hrs) 186. Demonstrate structured wiring/ smart wiring for home & office automation through visual aids. (05 hrs) 187. Visual demonstration of IoT based home automation/ control of electrical appliances through smartphone. (05 hrs) 188. Demonstrate software available for electrical wiring and circuits. (05 hrs)	Concept and Principles of estimation and costing. Different wiring layouts and Bill of material; domestic, commercial, and industrial wiring. Smart wiring concept Procedure for taking wireman permit and competency certificate. (10 hrs)
Engineering Drawing: 40 Hrs.			
Professional Knowledge ED 40 Hrs.	Read and apply engineering drawing for different application in the field	**Engineering Drawing:** Reading of Electrical Sign and Symbols. Sketches of Electrical components. Reading of Electrical wiring diagram and Layout diagram. Reading of Electrical earthing diagram. Drawing the schematic diagram of plate	

	of work.	and pipe earthing. Drawing of Electrical circuit diagram. Drawing of Block diagram of Instruments & equipment of trades.
Workshop Calculation & Science: 32 Hrs.		
Professional Knowledge WCS 32 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	**Workshop Calculation & Science:** **Friction** Friction - Lubrication **Algebra** Algebra - Addition, subtraction, multiplication & division Algebra - Theory of indices, algebraic formula, related problems **Elasticity** Elasticity - Elastic, plastic materials, stress, strain and their units and young's modulus **Profit and Loss** Profit and loss - Simple problems on profit & loss Profit and loss - Simple and compound interest **Estimation and Costing** Estimation and costing - Simple estimation of the requirement of material etc., as applicable to the trade. Estimation and costing - Problems on estimation and costing
Project work / Industrial visit		

SYLLABUS FOR CORE SKILLS
1. Employability Skills (Common for all CTS trades) (120 Hrs. + 60 Hrs.)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in www.bharatskills.gov.in / dgt.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 (For each additional unit trainees tool kit Sl. 1-20 is required additionally)			
1.	Steel rule	300 mm	21 Nos.
2.	Screw Driver	200 mm	21 Nos.
3.	Screw Driver	100 mm	21 Nos.
4.	Terminal screw Driver	75 mm (Connector)	21 Nos.
5.	Knife Electrician	D.B.	21 Nos.
6.	Hammer Ball peen	0.25 Kg	21 Nos.
7.	Plumb bob	115 grams	21 Nos.

8.	Combination pliers insulated	200 mm	21 Nos.
9.	Neon tester pencil bit type	500 volt	21 Nos.
10.	Try square	200 mm	21 Nos.
11.	Spanner set DE	Set of 6 (from 6x7 to 16x7)	21 Nos.
12.	Screw driver set (set of 5)	100-300 mm	21 Nos.
13.	File half round 2nd cut	250 mm	21 Nos.
14.	File round 2nd cut	150 mm	21 Nos.
15.	Soldering iron	60 W/230 V	21 Nos.
16.	Neon tester	230 V	21 Nos.
17.	Steel measuring tape	Pocket type	21 Nos.
18.	Bradawl	150 mm x 6mm square pointed	21 Nos.
19.	Set of Rowel punch	8, 10 mm	21 Nos.
20.	wooden mallet	1 kg. (75mm x 15mm)	21 Nos.
B. SHOP TOOLS & INSTRUMENTS			
21.	Conduit pipe cutting and threading machines adjustable	for 15 mm to 30 mm.	1 No.
22.	Conduit pipe bending machine, suitable	for 15 mm,18 mm, 25 mmand 30 mm pipe	1 No.
23.	Multi meter	0-5, 100, 200, 500 milli-amperes 0-150, 300, 600 V AC/DC	4 Nos.
24.	Hot wire Ammeter	0-15 Amps.	1 No.
25.	Wheatstone Bridge		1 No.
26.	Electrical power drilling machine	12mm, 250 volts universal type	1 No.
27.	Megger (Insulation tester)	500 volts	2 Nos.
28.	Voltmeter M.C.	0-300 volts	1 No.
29.	Voltmeter M.C/ Multi range	0.70, 150,300 & 600 V	1 No.
30.	Voltmeter M.C. Multi range	0-15,30,50 & 75 V	1 No.
31.	Voltmeter centre zero	15-0-15 volts	1 No.
32.	Voltmeter M.I. multi-range	0-150, 300, 600 V	2 Nos.
33.	Voltmeter M.I. multi-range	0-50, 75, 150 V	1 No.
34.	Ammeter M.I.	0-30 Amp, panel board	2 Nos.
35.	Ammeter MC	0 – 500 mA	3 Nos.
36.	Autotransformer	250V / (0 – 300) V,10A	2 Nos.
37.	Frequency meter	45 to 55 Hz	2 Nos.
38.	Power Factor meter	440 V, 20 A, Three Phase portable box type	2 Nos.
39.	Out Side Micrometer	0 - 25 mm least count 0.01mm	2 Nos.
40.	Solid State Solar Based Single Phase	5-30 Amps, 240 Volts	1 No.

	Energy Meter (Bidirectional)		
41.	Ammeter M.I.	0-5Amp. Panel board type	2 Nos.
42.	Ammeter M.I.	0 - 10 Amp. panel board mounting type	2 Nos.
43.	Ammeter M.C. Centre zero	5-0-5 Amp	2 Nos.
44.	Ammeter MC	0 - 1 Amp	1 No.
45.	Single phase KWH meter analog& digital	5A, 250 V AC	2 Nos. Each
46.	Three phase KWH meter analog& digital	25A, 415 V A. C	4 Nos. Each
47.	3 Phase KW meter	15A, 440 V	1 No.
48.	Watt meter Dynamo meter type	5 Amps. And 250 v, 1.25 kw	1 No.
49.	Clamp on ammeter	0-25A, 0-200A	2 Nos.
50.	Tachometer digital	Non-contact type 0-6000 RPM	1 No.
51.	Magnetic Flux Meter	0-500 tesla	2 Nos.
52.	Series Test Lamp	230V, 60W	4 Nos.
53.	Lux meter	lux meter LCD read out 0.05 to 7000 lumens with battery.	2 Nos.
54.	Meter Reading Instrument (MRI)		1 No.
55.	Hydrometer		2 Nos.
56.	Hydraulic crimping tool for UG cable crimping with bits	20 Sq. mm to 250sq mm	1 No.
C. LIST OF TOOLS & ACCESSORIES			
57.	Conduit pipe cutting and threading machine	adjustable for 15mm to 30mm.	1 No.
58.	Conduit pipe bending machine	suitable for 15mm, 18mm, 25mm and 30mm pipes	1 No.
59.	Bar magnet		1 No.
60.	Drill bit	6mm, 8mm & 10 mm	1 each
61.	Horse shoe magnet		1 No.
62.	Crimping tool	25 mm	1 No.
63.	Crimping tool	heavy duty	1 No.
64.	Crimping tool	9” Hex series	1 No.
65.	Small crimping tools (assorted)	10 - 100 mm (5 Nos.)	1 Set
66.	Crimping tool for telephone/ LAN cable		1 No.
67.	Wire stripper	150 mm	5 Nos.
68.	Rubber matting	2 meter x 1 meter x 9 mm	2 Nos.
69.	Wiring board on stand	3 meter x 1 meter with 0.5	5 Nos.

		meter projection on the top	
70.	Set of Wall jumper octagonal	37mm X 450mm and 37 X 600mm	4 sets
71.	Center punch	100 mm	2 Nos.
72.	Pliers side cutting insulated	200 mm	5 Nos.
73.	Pliers flat nose insulated	150 mm	5 Nos.
74.	Pliers round nose insulated	200 mm	5 Nos.
75.	Pliers long nose insulated	200 mm	5 Nos.
76.	Screw driver heavy duty	200 mm	2 Nos.
77.	Screw driver heavy duty	300 mm	5 Nos.
78.	Firmer chisel	1"	10 Nos.
79.	Gauge, wire imperial stainless steel marked in SWG & mm	Wire Gauge - Metric	4 Nos.
80.	Hammer Ball Peen	0.5 kg and 1.0 kg	5 Each
81.	Hammer cross Peen	0.5 kg	5 Nos.
82.	Rawal tool holder & Bit	No. 8, 10, 14, & 16	2 sets
83.	Scriber	150 mm	2 Nos.
84.	File flat	300 mm rough	5 Nos.
85.	File flat round	150 mm smooth	5 Nos.
86.	File round	300 mm 2nd cut	5 Nos.
87.	File triangular	150 mm 2nd cut	5 Nos.
88.	Spanner set of 6	Double ended (18x18, 20x22, 21x23, 24x27, 25x27, 30x32)	2 sets
89.	Adjustable spanner	300 mm	1 No.
90.	Foot print Grip	250 mm	2 Nos.
91.	Allen keys	Set 5 to 11	1 set
92.	Spirit level	300 mm	2 Nos.
93.	Electric soldering iron	125 watts 230-250 V	2 Nos.
94.	Blow lamp	1 liter capacity	2 Nos.
95.	Forge with hand blower		1 No.
96.	Bench vice	150 mm	5 Nos.
97.	Hand vice	50 mm jaw	5 Nos.
98.	Pipe vice Cast Iron with hardened jaw open type	100 mm	2 Nos.
99.	Scissors blade, SS	200 mm	As required
100.	Scissors blade, SS	150 mm	As required
101.	Contactor & auxiliary contacts	3 phase, 415 Volt, 25 Amp with 2 NO and 2 NC	2 Nos. each
102.	Limit Switch	Limit Switch, Liver operated 2A 500v, 2-contacts	2 Nos.

103.	Rotary Switch	16 A/440v	2 Nos.
104.	Relay- a. Cut out Relays b. Reverse current c. Over current d. Under voltage	 a. 16A, 440V b. 16A, 440V c. 16A, 440V d. 360V-440V	2 No. each
105.	Insulators including hardware fitting	Pin Type, shackle type, egg type & suspension type	2 Nos. each
106.	Tower ladder on type wheels	Min 10ft-Max 30ft	2 Nos.
107.	Portable extension ladder	Aluminium 6 to 9 meters	1 No.
108.	Trowel	150 mm	2 Nos.
109.	Miniature circuit breaker (MCB)	220V/ 6 Amps	2 Nos.
110.	Knife Switch DPDT fitted with fuse terminals	16 Amp	4 Nos.
111.	Knife Switch TPDT fitted with fuse terminals	16 Amp/ 440 V	4 Nos.
112.	Earth Plate	60cm X 60cm X 3.15mm Copper Plate 60cm X 60cm X 6mm GI Plate	1 Each
113.	Earth Electrode	Primary Electrode 2100x28x3.25mm Secondary Cu Strip 20x5mm	1 No.
114.	MCCB	100Amps, Triple pole	1 No.
115.	ELCB and RCCB	25Amps, double pole and 25Amps, double pole, IΔn 30 mA	1 Each
116.	Capacitors	Electrolytic, Ceramic, Polyester film, Variable, Dual run	2 Each
117.	Various Electronic components	Resistors, Diode, LED, Small transformer etc.	As required
118.	Various Lamps with fittings	**Halogen Incandescent Lamp,** Fluorescent tube, HP mercury vapor Lamp, High-pressure sodium Lamp Low-pressure sodium Lamp, LED Lamps, downlights, floodlights, spotlights, etc.	As required
119.	All types of CFL lamp &LED sets	5 watt, 15 watt, 25watt	3 each
120.	Cables : Twisted Pair Non-Metallic Sheathed Cable Underground Feeder Cable Ribbon Cable Metallic Sheathed Cable Multi-Conductor Cable Coaxial Cable Direct-Buried Cable	1 mtr each	AS required

121.	Cable Jointing Kit		As required
122.	Bus bar with brackets	1 mtr each	3 Nos.
123.	Electrician Helmet	Yellow Colour	2 Nos.
124.	Safety belt with provision for keeping tools		10 Nos.
125.	Rubber gloves	5000 Volts	2 pairs
126.	Panel Accessories	Cable ducts, ferrules, LED indicators, push buttons, rotary switches, timers, relays, MCB, MCCB, RCCB, etc.	As required
127.	Wiring Accessories (including modular & Industrial switchgears)	Modular frames, back boxes, switches, sockets, plugs, connectors, fuses, conduits (PVC & Metal), wiring channel, fasteners, smoke alarm, sunset switches, fan controllers, light dimmers, etc.	As required
128.	Solar Street Light	12V, 75Ah battery, 75 Wp solar panel, 12V, 10A dusk to dawn charge controller, 60 W LED lights and 9 m height pole all dismountable	01 Nos.
129.	Solar Traffic Light	12V, 75Ah battery, 75 Wp solar panel, 12V, 10A dusk to dawn charge controller, 15 W LED lights with suitable colors and 9 m height pole all dismountable	01 No.
130.	Solar DC pump	24V, 1 HP	01 No.
131.	Rechargeable battery	12 V, 100 Ah	As required
132.	Rechargeable battery	6 V, 7 Ah	As required
133.	LED lights	12V, DC, 5W	As required
134.	LED lights	6 V, DC, 5W	As required
135.	Solar panels	250 Wp, 15Wp	As required
136.	Solar charge controller with manual switch (Day lighting)	6V,5 A	As required
137.	EV Charger	3 phase input	1 No.
138.	EV Charger (Home)	1 Phase input	1 No.
139.	Motion Detector		5 Nos.
D. List of Equipment/ Shop Machinery			
140.	DC Power supply	250V DC, 25 Amp	1 No.
141.	Star Delta starter	Manual, Semi-automatic & Automatic	1 Each
142.	Automatic Reverse Forward starter		1 No.
143.	Single phasing preventer	415 V	1 No.
144.	DOL starter	For A.C Motors of 2 to 5 H.P.	1 No.

145.	Soft starter	1 ph	1 No.
146.	Lead Acid battery 75Ah	12 V	1 No.
147.	Battery Charger	15 V, Current controlled	1 No.
148.	Solar street light lamp set	12 V , 18/ 24 watts	4 No.
149.	Field regulator	0 - 1000 ohmic, 2 Amps	1 No.
150.	Transformer single phase	1 K.V.A. 250/100 V	2 Nos.
151.	D.C. Compound motor	3 H.P 250 V with 4 point starter and field regulator (Laboratory type)	1 No.
152.	D.C. shunt motor	3 H.P 250 V with 3 point starter and speed regulator (Laboratory type)	1 No.
153.	D. C. series motor	3 H.P 250 V with 2 point starter and speed regulator (Laboratory type)	1 No.
154.	MG Set consisting of squirrel cage induction motor 5 HP, 400 V cycle with directly coupled compound generator 3 KW, 250 V with built in panel board consisting of:	3 phase ACB, Star-Delta starter (contact type 8 point) & Automatic type, DC circuit breaker, Suitable voltmeter, Ammeter & indicating lamps on AC & DC side, Sunk field regulators, Field circuit ammeter	1Set
155.	CCTV Camera kit		1 No.
156.	UPS with battery	500VA, 230V	1 No.
157.	Personal computer system with printer	Latest configuration	1 No.
158.	LCD/LED projector		1 No.
159.	Domestic Appliances –		1 Each
	a. Electric Induction plate	1500 Watt, 240V	
	b. Electric Kettle	1500 Watts, 240V	
	c. Electric Iron	Automatic - 750 W, 240 V	
	d. Immersion Heater	1500 Watt, 240V	
	e. A.C. Ceiling Fan and AC Table Fan	68 Watt, 230 V	
	f. Geyser (Storage type)	10 litre	
	g. Mixture & Grinder	750 W, 240 V	
	h. Washing Machine Semi-automatic	5 Kg	
	i. Motor Pump set	1 HP, 1 Phase, 240 V	
	j. Refrigerator		
	k. Window and Split AC		
160.	DMX Controller		1 No.
161.	Rewinding Machine		1 No.
162.	Control Panel	5’ x 3’ x 1.5’	1 No.
E. Shop Floor Furniture and Materials			
163.	Working Bench	2.5 m x 1.20 m x 0.75 m	2 Nos.
164.	Demonstration table	2.5 x 1.25 x 0.75 m	2 Nos.
165.	Instructor’s table	Junior Executive	1 No.

166.	Instructor's chair	Full Arm, Caned Back & Seat	2 Nos.
167.	Computer chair - Revolving		2 Nos.
168.	Metal Rack	100cm x 150cm x 45 cm	4 Nos.
169.	Lockers with 20 drawers	standard size with key	1 No.
170.	Almirah	2.5 m x 1.20 m x 0.5 m	1 No.
171.	Almirah	1.8 x 1.2 x 0.45 m	1 No.
172.	Black board/ white board	minimum 4 x 6 feet	1 No.
173.	Blackboard with easel	3' x 6'	1 No.
174.	Stools	1' x 1'x 1.5'	20 Nos.
175.	Fire Extinguisher CO_2	2 Kg	2 Nos.
176.	Fire Buckets	Standard size	2 Nos.

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.*

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