

SYLLABUS FOR ELECTRICIAN TRADE			
FIRST YEAR			
Duration	Reference Learning Outcome	Professional Skills (Trade Practical) With Indicative Hours	Professional Knowledge (Trade Theory)
Professional Skill 150 Hrs.; Professional Knowledge 42 Hrs.	Prepare profile with an appropriate accuracy as per drawing following safety precautions.	1. Visit various sections of the institutes and location of electrical installations. (03hrs.)	Scope of the electrician trade. Safety rules and safety signs. Types and working of fire extinguishers. (07 hrs.)
		2. Identify safety symbols and hazards. (02Hrs.)	
		3. Preventive measures for electrical accidents and practice steps to be taken in such accidents. (03hrs.)	
		4. Practice safe methods of fire fighting in case of electrical fire. (02hrs.)	First aid safety practice. Hazard identification and prevention. Personal safety and factory safety. Response to emergencies e.g. power failure, system failure and fire etc. (07 hrs.)
		5. Use of fire extinguishers. (05 Hrs.)	
		6. Practice elementary first aid. (03hrs.)	
		7. Rescue a person and practice artificial respiration. (02Hrs.)	Concept of Standards and advantages of BIS/ISI. Trade tools specifications. Introduction to National
		8. Disposal procedure of waste materials. (02Hrs.)	
		9. Use of personal protective equipment. (03hrs.)	
		10. Practice on cleanliness and procedure to maintain it. (05 hrs.)	
		11. Identify trade tools and machineries. (05Hrs.)	
		12. Practice safe methods of lifting and handling of tools	

		& equipment. (05 Hrs.) 13. Select proper tools for operation and precautions in operation. (05 Hrs.) 14. Care & maintenance of trade tools. (05 Hrs.)	Electrical Code-2011. (07 hrs.)
		15. Operations of allied trade tools. (05 Hrs.) 16. Workshop practice on filing and hacksawing. (10Hrs.) 17. Prepare hand coil winding assembly. (5 Hrs.) 18. Practice on preparing T-joint, straight joint and dovetail joint on wooden blocks. (15Hrs.) 19. Practice sawing, planing, drilling and assembling for making a wooden switchboard. (15Hrs.)	Allied trades: 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. (07 hrs.)
		20. Practice in marking and cutting of straight and curved pieces in metal sheets, making holes, securing by screw and riveting. (10 Hrs.) 21. Workshop practice on drilling, chipping, internal and external threading of different sizes. (20Hrs.) 22. Practice of making square holes in crank handle. (5 Hrs.) 23. Prepare an open box from metal sheet. (15 Hrs.)	Marking tools; calipers Dividers, Surface plates, Angle plates, Scribes, 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. (14hrs.)
Professional Skill 125 Hrs.;	Prepare electrical wire joints, carry out soldering, crimping and measure	24. Prepare terminations of cable ends (02 hrs.) 25. Practice on skinning, twisting and crimping. (15	Fundamentals of electricity, definitions, units & effects of electric current. Conductors and insulators.

Knowledge 35Hrs.	insulation resistance of underground cable.	Hrs.) 26. Identify various types of cables and measure conductor size using SWG and micrometer. (8 Hrs.)	Conducting materials and their comparison. (07 hrs.)
		27. Make simple twist, married, Tee and western union joints. (18 Hrs.) 28. Make britannia straight, britannia Tee and rat tail joints. (18 Hrs.) 29. Practice in Soldering of joints / lugs. (14 Hrs.)	Joints in electrical conductors. Techniques of soldering. Types of solders and flux. (14 hrs.)
		30. Identify various parts, skinning and dressing of underground cable. (15 Hrs.) 31. Make straight joint of different types of underground cable. (15 Hrs.) 32. Test insulation resistance of underground cable using megger. (05 hrs.) 33. Test underground cables for faults and remove the fault. (15 Hrs.)	Underground cables: Description, types, various joints and testing procedure. Cable insulation & voltage grades Precautions in using various types of cables. (14 hrs.)
Professional Skill 200Hrs.; Professional Knowledge 20Hrs.	Verify characteristics of electrical and magnetic circuits.	34. Practice on measurement of parameters in combinational electrical circuit by applying Ohm's Law for different resistor values and voltage sources and analyse by drawing graphs. (10Hrs.) 35. Measure current and voltage in electrical circuits to verify Kirchhoff's Law (10 Hrs.)	Ohm's Law; Simple electrical circuits and problems. Kirchoff's Laws and applications. Series and parallel circuits. Open and short circuits in series and parallel networks. (07 hrs.)

		<p>36. Verify laws of series and parallel circuits with voltage source in different combinations. (05Hrs.)</p> <p>37. Measure voltage and current against individual resistance in electrical circuit (10 hrs.)</p> <p>38. Measure current and voltage and analyse the effects of shorts and opens in series circuit. (05 Hrs.)</p> <p>39. Measure current and voltage and analyse the effects of shorts and opens in parallel circuit. (05 Hrs.)</p>	
		<p>40. Measure resistance using voltage drop method. (03Hrs.)</p> <p>41. Measure resistance using wheatstone bridge. (02 Hrs.)</p> <p>42. Determine the thermal effect of electric current. (03Hrs.)</p> <p>43. Determine the change in resistance due to temperature. (02Hrs.)</p> <p>44. Verify the characteristics of series parallel combination of resistors. (5 Hrs.)</p>	<p>Laws of Resistance and various types of resistors. Wheatstone bridge; principle and its applications. Effect of variation of temperature on resistance. Different methods of measuring the values of resistance. Series and parallel combinations of resistors. (07 hrs.)</p>
		<p>45. Determine the poles and plot the field of a magnet bar. (05Hrs.)</p> <p>46. Wind a solenoid and determine the magnetic effect of electric current. (05Hrs.)</p> <p>47. Measure induced emf due to change in magnetic field.</p>	<p>Magnetic terms, magnetic materials and properties of magnet. Principles and laws of electro-magnetism. Self and mutually induced EMFs. Electrostatics: Capacitor- Different types, functions,</p>

		<p>(05hrs.)</p> <p>48.Determine direction of induced emf and current. (05hrs.)</p> <p>49.Practice on generation of mutually induced emf. (05hrs.)</p> <p>50.Measure the resistance, impedance and determine inductance of choke coils in different combinations. (05Hrs.)</p> <p>51.Identify various types of capacitors, charging / discharging and testing. (05 Hrs.)</p> <p>52.Group the given capacitors to get the required capacity and voltage rating. (05 Hrs.)</p>	<p>grouping and uses. (14 hrs.)</p>
		<p>53.Measure current, voltage and PF and determine the characteristics of RL, RC and RLC in AC series circuits. (08 Hrs.)</p> <p>54.Measure the resonance frequency in AC series circuit and determine its effect on the circuit. (07 hrs.)</p> <p>55.Measure current, voltage and PF and determine the characteristics of RL, RC and RLC in AC parallel circuits. (08 Hrs.)</p> <p>56.Measure the resonance frequency in AC parallel circuit and determine its effects on the circuit. (07 hrs.)</p>	<p>Inductive and capacitive reactance, their effect on AC circuit and related vector concepts.</p> <p>Comparison and Advantages of DC and AC systems.</p> <p>Related terms frequency, Instantaneous value, R.M.S. value Average value, Peak factor, form factor, power factor and Impedance etc.</p> <p>Sine wave, phase and phase difference.</p> <p>Active and Reactive power.</p> <p>Single Phase and three-phase system.</p> <p>Problems on A.C. circuits. (14 hrs.)</p>

		<p>57. Measure power, energy for lagging and leading power factors in single phase circuits and compare characteristic graphically. (08 Hrs.)</p> <p>58. Measure Current, voltage, power, energy and power factor in three phase circuits. (07 hrs.)</p> <p>59. Practice improvement of PF by use of capacitor in three phase circuit. (05 Hrs.)</p>	
		<p>60. Ascertain use of neutral by identifying wires of a 3-phase 4 wire system and find the phase sequence using phase sequence meter. (10 Hrs.)</p> <p>61. Determine effect of broken neutral wire in three phase four wire system. (05 hrs.)</p> <p>62. Determine the relationship between Line and Phase values for star and delta connections. (10Hrs.)</p> <p>63. Measure the Power of three phase circuit for balanced and unbalanced loads. (15 Hrs.)</p> <p>64. Measure current and voltage of two phases in case of one phase is short-circuited in three phase four wire system and compare with healthy system. (10 hrs.)</p>	<p>Advantages of AC poly-phase system.</p> <p>Concept of three-phase Star and Delta connection.</p> <p>Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load.</p> <p>Phase sequence meter. (14 hrs.)</p>
Professional	Install, test and	65. Use of various types of cells.	Chemical effect of electric

<p>Skill 50 Hrs.;</p> <p>Professional Knowledge 14 Hrs.</p>	<p>maintenance of batteries and solar cell.</p>	<p>(08 Hrs.)</p> <p>66.Practice on grouping of cells for specified voltage and current under different conditions and care. (12 Hrs.)</p> <p>67.Prepare and practice on battery charging and details of charging circuit. (12 Hrs.)</p> <p>68.Practice on routine, care/ maintenance and testing of batteries. (08 Hrs.)</p> <p>69.Determine the number of solar cells in series / parallel for given power requirement. (10 Hrs.)</p>	<p>current and Laws of electrolysis.</p> <p>Explanation of Anodes and cathodes.</p> <p>Types of cells, advantages / disadvantages and their applications.</p> <p>Lead acid cell; Principle of operation and components.</p> <p>Types of battery charging, Safety precautions, test equipment and maintenance.</p> <p>Basic principles of Electro-plating and cathodic protection</p> <p>Grouping of cells for specified voltage and current.</p> <p>Principle and operation of solar cell.</p> <p>(14 hrs.)</p>
<p>Professional Skill 175 Hrs.;</p> <p>Professional Knowledge 49 Hrs.</p>	<p>Estimate, Assemble, install and test wiring system.</p>	<p>70.Identify various conduits and different electrical accessories. (8 Hrs.)</p> <p>71.Practice cutting, threading of different sizes & laying Installations. (17 Hrs.)</p> <p>72.Prepare test boards / extension boards and mount accessories like lamp holders, various switches, sockets, fuses, relays, MCB, ELCB, MCCB etc. (25 Hrs.)</p> <p>73.Draw layouts and practice in PVC Casing-capping, Conduit wiring with minimum to more number of points of minimum 15 mtr length. (15 Hrs.)</p>	<p>I.E. rules on electrical wiring.</p> <p>Types of domestic and industrial wirings.</p> <p>Study of wiring accessories e.g. switches, fuses, relays, MCB, ELCB, MCCB etc.</p> <p>Grading of cables and current ratings.</p> <p>Principle of laying out of domestic wiring.</p> <p>Voltage drop concept.</p> <p>(14 hrs.)</p> <p>PVC conduit and Casing-capping wiring system.</p> <p>Different types of wiring - Power, control, Communication and entertainment wiring.</p>

		<p>74. Wire up PVC conduit wiring to control one lamp from two different places. (10 Hrs.)</p> <p>75. Wire up PVC conduit wiring to control one lamp from three different places. (10 Hrs.)</p> <p>76. Wire up PVC conduit wiring and practice control of sockets and lamps in different combinations using switching concepts. (15 Hrs.)</p>	<p>Wiring circuits planning, permissible load in sub-circuit and main circuit. (14 hrs.)</p>
		<p>77. Wire up the consumers main board with ICDP switch and distribution fuse box. (10 Hrs.)</p> <p>78. Prepare and mount the energy meter board. (10 Hrs.)</p> <p>79. Estimate the cost/bill of material for wiring of hostel/ residential building and workshop. (10 Hrs.)</p> <p>80. Practice wiring of hostel and residential building as per IE rules. (15 Hrs.)</p> <p>81. Practice wiring of institute and workshop as per IE rules. (15 Hrs.)</p> <p>82. Practice testing / fault detection of domestic and industrial wiring installation and repair. (15 Hrs.)</p>	<p>Estimation of load, cable size, bill of material and cost. Inspection and testing of wiring installations. Special wiring circuit e.g. godown, tunnel and workshop etc. (21 hrs.)</p>
Professional Skill 25 Hrs.; Professional	Plan and prepare Earthing installation.	83. Prepare pipe earthing and measure earth resistance by earth tester / megger. (10 Hrs.)	Importance of Earthing. Plate earthing and pipe earthing methods and IEE regulations.

Knowledge 07 Hrs.		84. Prepare plate earthing and measure earth resistance by earth tester / megger. (10 Hrs.) 85. Test earth leakage by ELCB and relay. (5 Hrs.)	Earth resistance and earth leakage circuit breaker. (07 hrs.)
Professional Skill 50 Hrs.; Professional Knowledge 26 Hrs.	Plan and execute electrical illumination system and test.	86. Install light fitting with reflectors for direct and indirect lighting. (10 Hrs.) 87. Group different wattage of lamps in series for specified voltage. (5 Hrs.) 88. Practice installation of various lamps e.g. fluorescent tube, HP mercury vapour, LP mercury vapour, HP sodium vapour, LP sodium vapour, metal halide etc. (18 Hrs.) 89. Prepare decorative lamp circuit using drum switches. (5 Hrs.) 90. Prepare decorative lamp circuit to produce rotating light effect/running light effect. (6 Hrs.) 91. Install light fitting for show case lighting. (6 Hrs.)	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. (14 hrs.)
02 Weeks (Professional Skill 50 Hrs.; Professional Knowledge 26 Hrs.)	Select and perform measurements using analog / digital instruments	92. Practice on various analog and digital measuring Instruments. (5 Hrs.) 93. Practice on measuring instruments in single and three phase circuits e.g. multi-meter, Wattmeter, Energy meter, Phase sequence meter and Frequency meter etc. (15 Hrs.)	Classification of electrical instruments and essential forces required in indicating instruments. PMMC and Moving iron instruments. Measurement of various electrical parameters using different analog and digital instruments. Measurement of energy in

		<p>94. Measure power in three phase circuit using two wattmeter methods. (8 Hrs.)</p> <p>95. Measure power factor in three phase circuit by using power factor meter and verify the same with voltmeter, ammeter and wattmeter readings. (12 Hrs.)</p> <p>96. Measure electrical parameters using tong tester in three phase circuits. (10 Hrs.)</p>	<p>three phase circuit. (14 hrs.)</p>
<p>Professional Skill 25 Hrs.;</p> <p>Professional Knowledge 07 Hrs.</p>	<p>Perform testing, verify errors and calibrate instruments.</p>	<p>97. Practice for range extension and calibration of various measuring instruments. (10 Hrs.)</p> <p>98. Determine errors in resistance measurement by voltage drop method. (8 Hrs.)</p> <p>99. Test single phase energy meter for its errors. (7 Hrs.)</p>	<p>Errors and corrections in measurement.</p> <p>Loading effect of voltmeter and voltage drop effect of ammeter in circuits.</p> <p>Extension of range and calibration of measuring instruments. (07 hrs.)</p>
<p>Professional Skill 75 Hrs.;</p> <p>Professional Knowledge 27 Hrs.</p>	<p>Plan and carry out installation, fault detection and repairing of domestic appliances.</p>	<p>100. Dismantle and assemble electrical parts of various electrical appliances e.g. cooking range, geyser, washing machine and pump set. (25 Hrs.)</p> <p>101. Service and repair of bell/buzzer. (5 Hrs.)</p> <p>102. Service and repair of electric iron, electric kettle, cooking range and geyser. (12 Hrs.)</p> <p>103. Service and repair of induction heater and oven. (10 Hrs.)</p>	<p>Working principles and circuits of common domestic equipment and appliances.</p> <p>Concept of Neutral and Earth. (21 hrs.)</p>

		<p>104. Service and repair of mixer and grinder. (10 Hrs.)</p> <p>105. Service and repair of washing machine. (13Hrs.)</p>	
Professional Skill 75 Hrs.; Professional Knowledge 21 Hrs.	Execute testing, evaluate performance and maintenance of transformer.	<p>106. Verify terminals, identify components and calculate transformation ratio of single-phase transformers. (8 Hrs.)</p> <p>107. Perform OC and SC test to determine and efficiency of single-phase transformer. (12Hrs.)</p> <p>108. Determine voltage regulation of single-phase transformer at different loads and power factors. (12 Hrs.)</p> <p>109. Perform series and parallel operation of two single phase transformers. (12 Hrs.)</p> <p>110. Verify the terminals and accessories of three phase transformer HT and LT side. (6Hrs.)</p>	<p>Working principle, construction and classification of transformer. Single phase and three phase transformers.</p> <p>Turn ratio and e.m.f. equation.</p> <p>Series and parallel operation of transformer.</p> <p>Voltage Regulation and efficiency.</p> <p>Auto Transformer and instrument transformers (CT & PT). (14 hrs.)</p>
		<p>111. Perform 3 phase operation (i) delta-delta (ii) delta-star (iii) star-star (iv) star-delta by use of three single phase transformers. (6 Hrs.)</p> <p>112. Perform testing of transformer oil. (6 Hrs.)</p> <p>113. Practice on winding of</p>	<p>Method of connecting three single phase transformers for three phase operation.</p> <p>Types of Cooling, protective devices, bushings and termination etc.</p> <p>Testing of transformer oil.</p> <p>Materials used for winding and winding wires in small transformer. (07 hrs.)</p>

		small transformer. (8 Hrs.) 114. Practice of general maintenance of transformer. (5 Hrs.)	
Project work / Industrial visit Broad Areas: <ul style="list-style-type: none"> a) Overload protection of electrical equipment b) Automatic control of streetlight/night lamp c) Fuse and power failure indicator using relays d) Door alarm/indicator e) Decorative light with electrical flasher 			