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

COMPETENCY BASED CURRICULUM

ELECTRICIAN

(Duration: Two Years)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL - 5

SECTOR – ELECTRICAL

Industrial Training Institute

Directorate General of Training

Skill India
कौशल भारत - कुशल भारत

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING/ ASSESSABLE OUTCOME	
LEARNING / ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**
1. Apply safe working practices	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements and according to site policy.
	1.2 Recognize and report all unsafe situations according to site policy.
	1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1.4 Identify, handle and store / dispose off dangerous goods and substances according to site policy and procedures following safety regulations and requirements.
	1.5 Identify and observe site policies and procedures in regard to illness or accident.
	1.6 Identify safety alarms accurately.
	1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1.8 Identify and observe site evacuation procedures according to site policy.
	1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1.10 Identify basic first aid and use them under different circumstances.
	1.11 Identify different fire extinguisher and use the same as per requirement.
2. Comply environment regulation and housekeeping	2.1 Identify environmental pollution & contribute to the avoidance of instances of environmental pollution.
	2.2 Deploy environmental protection legislation & regulations
	2.3 Take opportunities to use energy and materials in an environmentally friendly manner
	2.4 Avoid waste and dispose waste as per procedure
	2.5 Recognize different components of 5S and apply the same in the working environment.
3. Interpret & use company and technical	3.1 Obtain sources of information and recognize information.

communication	3.2Use and draw up technical drawings and documents.
	3.3 Use documents and technical regulations and occupationally related provisions.
	3.4 Conduct appropriate and target oriented discussions with higher authority and within the team.
	3.5 Present facts and circumstances, possible solutions &use English special terminology.
	3.6 Resolve disputes within the team
	3.7 Conduct written communication.
4. Demonstrate basic mathematical concept and principles to perform practical operations.	4.1 Semester examination to test basic skills on arithmetic, algebra, trigonometry and statistics.
	4.2 Applications will be assessed during execution of assessable outcome and will also be tested during theory and practical examination.
5. Understand and explain basic science in the field of study including simple machine.	5.1 Semester examination to test basic skills on science in the field of study including friction, heat, temperature and simple machine.
	5.2 Applications will be assessed during execution of assessable outcome and will also be tested during theory and practical examination.
6. Read and apply engineering drawing for different application in the field of work.	6.1 Semester examination to test basic skills on engineering drawing.
	6.2 Applications will be assessed during execution of assessable outcome and will also be tested during theory and practical examination.
7. Understand and apply the concept in productivity, quality tools, and labour welfare legislation in day to day work to improve productivity & quality.	7.1 Semester examination to test the concept in productivity, quality tools and labour welfare legislation.
	7.2 Applications will be assessed during execution of assessable outcome.
8. Explain energy conservation, global warming and pollution and	8.1 Semester examination to test knowledge on energy conservation, global warming and pollution.

contribute in day to day work by optimally using available resources.	8.2 Their applications will be assessed during execution of assessable outcome.
9. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	9.1 Semester examination to test knowledge on personnel finance, entrepreneurship.
	9.2 Their applications will be assessed during execution of assessable outcome.
10. Utilize basic computer applications and internet to take benefit of IT developments in the industry.	10.1 Semester examination to test knowledge on basic computer working, basic operating system and uses internet services.
	10.2 Their applications will be assessed during execution of assessable outcome.

SPECIFIC LEARNING/ ASSESSABLE OUTCOME	
LEARNING / ASSESSABLE OUTCOME	**ASSESSMENT CRITERIA**
SEMESTER-I	
11. Prepare profile with an appropriate accuracy as per drawing.	11.1 Identify the trade tools; practice their uses with safety, care & maintenance.
	11.2 Prepare a simple half lap joint using firmer chisel with safety.
	11.3 Prepare tray using sheet metal with the safety.
	11.4 Practice on fixing surface mounting type of accessories.
	11.5 Practice on connecting of electrical accessories.
	11.6 Make and wire up of a test board and test it.
12. Prepare electrical wire joints, carry out soldering, crimping and measure insulation resistance of underground cable.	12.1 Observe safety/ precaution during joints & soldering.
	12.2 Make simple straight twist and rat-tail joints in single strand conductors.
	12.3 Make married and 'T' (Tee) joint in stranded conductors.
	12.4 Prepare a Britannia straight and 'T' (Tee) joint in bare conductors.
	12.5 Prepare western union joint in bare conductor.
	12.6 Solder the finished copper conductor joints with precaution.
	12.7 Prepare termination of cable lugs by using crimping tool.
	12.8 Make straight joint in different types of underground cables.
	12.9 Measure insulation resistance of underground cable.
13. Verify characteristics of electrical and magnetic circuits.	13.1 Identify types of wires, cables and verify their specifications.
	13.2 Verify the characteristics of series, parallel and its combination circuit.
	13.3 Analyze the effect of the short and open in series and parallel circuits.
	13.4 Verify the relation of voltage components of RLC series circuit in AC.
	13.5 Determine the power factor by direct and indirect methods in an AC single phase RLC parallel circuit.
	13.6 Identify the phase sequence of a 3 ø supply using a phase-sequence meter.
	13.7 Prepare / connect a lamp load in star and delta and determine relationship between line and phase values with precaution.
	13.8 Connect balanced and unbalanced loads in 3 phase star system and measure the power of 3 phase loads.
	13.9 Make the solenoid and determine its polarity for the given direction of current.

	13.10 Group the given capacitors to get the required capacity and voltage rating.
SEMESTER-II	
14. Install, test and maintenance of batteries and solar cell.	14.1 Assemble a DC source 6V/500 mA using 1.5V cells.
	14.2 Determine the internal resistance of cell and make grouping of cells.
	14.3 Practice on charging of battery and test for its condition with safety/ precaution.
	14.4 Installation and maintenance of batteries.
	14.5 Determine total number of cells required for a given power requirement.
15. Estimate, Assemble, install and test wiring system.	15.1 Comply with safety & IE rules when performing the wiring.
	15.2 Prepare and mount the energy meter board.
	15.3 Draw and wire up the consumers main board with ICDP switch and distribution fuse box.
	15.4 Draw and wire up a bank/hostel/jail in PVC conduit.
	15.5 Identify the types of fuses their ratings and applications.
	15.6 Identify the parts of a relay, MCB & ELCB and check its operation.
	15.7 Estimate the cost of material for wiring in PVC channel for an office room having 2 lamps, 1 Fan, one 6A socket outlet and wire up.
	15.8 Estimate the requirement for conduit wiring (3 phase) and wire up.
	15.9 Estimate the materials and wire up the lighting circuit for a godown.
	15.10 Estimate the materials and wire up a lighting circuit for a corridor in conduit.
	15.11 Test, locate the fault and repair a domestic wiring installation.
16. Plan and prepare Earthing installation.	16.1 Plan work in compliance with standard safety norms related with earthing installation.
	16.2 Install the pipe earthing and test it.
	16.3 Install the plate earthing and test it.
	16.4 Measure the earth electrode resistance using earth tester.
	16.5 Carry out earth resistance improvement.
17. Plan and execute electrical illumination system and test.	17.1 Plan work in compliance with standard safety norms related with electrical illumination system.
	17.2 Install light fitting with reflectors for direct and indirect lighting.

	17.3 Assemble and connect a & single twin tube fluorescent light.
	17.4 Connect, install and test the HPMV & HPSV lamp with accessories.
	17.5 Prepare and test a decorative serial lamp set for 240 V using 6V bulb and flasher.
	17.6 Install light fitting for show case window lighting.
18. Select and perform measurements using analog / digital instruments	18.1 Identify the type of electrical instruments.
	18.2 Extend the range of MC voltmeter and ammeter.
	18.3 Measure the frequency by frequency meter.
	18.4 Measure the power and energy in a single & three phase circuit using wattmeter and energy meter with CT and PT.
	18.5 Measure the value of resistance, voltage and current using digital multimeter.
	18.6 Measure the power factor in poly-phase circuit and verify the same with voltmeter, ammeter, watt-meter readings.
19. Perform testing, verify errors and calibrate instruments.	19.1 Test single phase energy meter for its errors.
	19.2 Determine the measurement errors while measuring resistance by voltage drop method.
	19.3 Calibrate the analog multimeter.
20. Plan and carry out installation, fault detection and repairing of domestic appliances.	20.1 Plan work in compliance with standard safety norms related with domestic appliances.
	20.2 Service and Repair of calling bell/ buzzer/ Alarm.
	20.3 Service and repair an automatic iron.
	20.4 Repair and service of oven having multi-range heat control.
	20.5 Replace the heating element in a kettle and test.
	20.6 Service and repair an induction heater.
	20.7 Service and repair a geyser.
	20.8 Service and repair a mixer.
	20.9 Service and repair of washing machine.
	20.10 Install a pump set.
	20.11 Service and repair of table fan.
	20.12 Service, repair and install a ceiling fan.
21. Execute testing, evaluate performance and maintenance of transformer.	21.1 Plan work in compliance with standard safety norms related with transformer.
	21.2 Identify the types of transformers and their specifications.
	21.3 Identify the terminals; verify the transformation ratio of a single phase transformer.
	21.4 Connect and test a single phase auto- transformer.

	21.5 Determine the losses (iron loss and copper loss) and the regulation of a single phase transformer at different loads.
	21.6 Measure the current and voltage using CT and PT.
	21.7 Carry out winding for small transformer of 1KVA rating.
	21.8 Test the transformer oil with oil testing kit.
	21.9 Connect 3 single phase transformers for 3 phase operation of - a) delta-delta b) delta-star c) star-star d) star-delta.
	21.10 Connect the given two single phase transformers a) parallel b) series (secondary only) and measure voltage.
	21.11 Connect & test 3 phase transformer in parallel.(Parallel operation)
SEMESTER-III	
22. Plan, Execute commissioning and evaluate performance of DC machines.	22.1 Plan work in compliance with standard safety norms related with DC machines.
	22.2 Determine the load performance of a different type of DC generator on load.
	22.3 Connect, start, run and reverse direction of rotation of different types of DC motors.
	22.4 Conduct the load performance tests on different type of DC motor.
	22.5 Control the speed of a DC motor by different method.
23. Execute testing, and maintenance of DC machines and motor starters.	23.1 Test a DC machine for continuity and insulation resistance.
	23.2 Maintenance, troubleshooting & servicing of DC machines.
	23.3 Test armature by using growler.
	23.4 Maintain, service and trouble shoot the DC motor starter.
24. Plan, Execute commissioning and evaluate performance of AC motors.	24.1 Plan work in compliance with standard safety norms related with AC motors.
	24.2 Draw circuit diagram and connect forward & reverse a 3 phase squirrel cage induction motor.
	24.3 Start, run and reverse an AC 3 phase squirrel cage induction motor by different type of starters.
	24.4 Measure the slip of 3 phase squirrel cage induction motor by tachometer for different output. Draw slip / load characteristics of the motor.
	24.5 Determine the efficiency of 3 phase squirrel cage induction motor by no load test/ blocked rotor test and brake test.
	24.6 Plot the speed torque (Slip/Torque) characteristics of slip ring induction motor.
	24.7 Speed control of 3 phase induction motor.
	24.8 Connect, start and run a 3 phase synchronous motor.
	24.9 Connect start, run, control speed and reverse the DOR of

	different type of single phase motors.
	24.10 Install a single phase AC motor.
25. Execute testing, and maintenance of AC motors and starters.	25.1 Test continuity and insulation of various AC motors.
	25.2 Maintain, service and trouble shoot of three phase AC motors.
	25.3 Maintain, service and trouble shoot of different types of single phase AC motors.
	25.4 Maintain, service and trouble shoot the AC motor starter.
26. Plan, execute testing, evaluate performance and carry out maintenance of Alternator / MG set.	26.1 Plan work in compliance with standard safety norms related with Alternator & MG set.
	26.2 Connect start and run an alternator and build up the voltage.
	26.3 Determine the load performance of a 3 phase alternator.
	26.4 Start and load a MG set with 3 phase induction motor coupled to DC shunt generator and build up the voltage.
	26.5 Alignment of MG set.
	26.6 Preventive and breakdown Maintenance of alternator / MG set.
	26.7 Explain the effect of excitation current in terms of V-curves of synchronous motor.
27. Execute parallel operation of alternators.	27.1Parallel operation of an alternator , a. Bright lamp method c. Dark lamp method b. Bright and dark lamp method
	27.2 Parallel operation of an alternator by using synchroscope.
28. Distinguish, organise and perform motor winding.	28.1 Rewind the field coil & armature winding.
	28.2 a table fan and ceiling fan.
	28.3 Draw winding diagram & rewind a single phase split type motor (Concentric coil winding).
	28.4 Winding diagram & rewind a 3 phase squirrel cage induction motor (single layer distributed winding).
	28.5 Draw winding diagram & rewind a 3 phase induction motor (single layer concentric type half coil connection).
	28.6 Draw winding diagram & rewind a 3 phase squired cage induction motor. (Double layer distributed type winding)
SEMESTER-IV	
29. Assemble simple electronic circuits and test for functioning.	29.1 Practice soldering on components, lug and board with safety.
	29.2 Identify the passive /active components by visual appearance, Code number and test for their condition.
	29.3 Identify the control and functional switches in CRO and measure

	the D.C. & A.C. voltage, frequency and time period.
	29.4 Construct and test a half &full wave rectifiers with and without filter circuits.
	29.5 Construct circuit by using transistor as a switch.
	29.6 Construct and test a UJT as relaxation oscillator & electronic timer.
	29.7 Construct amplifier circuit using Transistor, FET and JFET and test.
	29.8 Construct and test lamp dimmer using TRIAC/DIAC.
	29.9 Test IGBT and use in circuit for suitable operation.
	29.10 Construct and test the universal motor speed controller using SCR with safety.
	29.11 Construct and test logic gate circuits.
30. Assemble accessories and carry out wiring of control cabinets and equipment.	30.1 Draw the layout diagram of 3 phase AC motor control cabinet.
	30.2 Mount the control elements & wiring accessories on the control panel.
	30.3 Practice wiring in control cabinet for local and remote control of induction motor.
	30.4 Draw & wire up the control panel for forward/ reverse operation of induction motor.
	30.5 Practice wiring for automatic start delta starter.
	30.6 Draw & wire up control panel for sequential motor control for three motors.
	30.7 Draw & wire up the control panel for a given circuit diagram and connect the motor.
	30.8 Test the control panel for all the required logics.
31. Perform speed control of AC and DC motors by using solid state devices.	31.1 Control the speed of DC motor by using DC drive.
	31.2 Speed control of universal motor by using SCR.
	31.3 Control speed and reverse the direction of rotation of different type of three phase induction motors using VVVF control /AC drive
32. Detect the faults and troubleshoot inverter, stabilizer, battery charger, emergency light and UPS etc.	32.1 Operation and maintenance of inverter.
	32.2 Troubleshoot, service and maintain a voltage stabilizer.
	32.3 Identify the parts, trace the connection and test the DC regulated power supply with safety.
	32.4 Troubleshoot and service a DC regulated power supply.
	32.5 Test battery charger for its operation.
	32.6 Prepare an emergency light.
	32.7 Carryout maintenance of UPS.

33. Plan, assemble and install solar panel.	33.1 Plan work in compliance with solar panel installation norms.
	33.2 Combination of solar cells for given power requirement
	33.3 Assemble and install solar panel.
	33.4 Check the functionality of solar panel.
34. Erect overhead domestic service line and outline various power plant layout.	34.1 Prepare single line diagram of thermal, hydel, solar and wind power plants.
	34.2 Prepare layout plan and single line diagram of transmission line.
	34.3 Draw an overhead and domestic service line.
	34.4 Erect an overhead service line pole for single phase 240v distribution system.
	34.5 Identify different type of insulator used in HT and LT line
	34.6 Fasten jumper in insulators.
	34.7 Connect feeder cable with domestic service line.
35. Examine the faults and carry out repairing of circuit breakers.	35.1 Prepare layout plan and single line diagram of Distribution substation
	35.2 Illustrate application of relays in control circuits and examine its operation.
	35.3 Identify parts of circuit breaker and check its operation.