

ELECTRICAL TECHNOLOGY (CODE NO. 819)

JOB ROLE: FIELD TECHNICIAN SESSION 2019-2020 CLASS XII

1. Introduction

After successfully completing the two years of Senior Secondary Skill Course the student would have acquired relevant appropriate and adequate technical knowledge together with professional skills and competencies in the field of Electrical Technology so that he/she is properly equipped to take up gainful employment in this vocation.

2. Course Objectives

A. Understanding of

1. The relevant basic concepts and principles in basic science subjects (Physics, Chemistry and Mathematics) so that he/she is able to understand the different subjects.
2. The basic concepts in engineering drawing.
3. The concepts, principles of working, maintenance, constructional details and functions of electrical motors, electrical appliances, measuring and testing instruments and electrical circuits.
4. Testing, installation, fault identification and repairing of electrical motors, appliances and instruments.
5. Different types of electrical wiring.

B. Adequate Professional Skills and Competencies in

1. Testing, installation, commissioning, fault location, repairing, servicing and major repairs of electrical motors, appliances and instruments.
2. Undertaking complete house wiring jobs, testing, location of faults and repairing of house wiring.

C. A Healthy and Professional Attitude so that He/ She has

1. An analytical approach while working on a job.
2. An open mind while locating/rectifying faults.
3. Respect for working with his/her own hands.
4. Respect for honesty, punctuality and truthfulness.

3. Curriculum

This course is a planned sequence of instructions consisting of Units meant for developing employability and Skills competencies of students of Class XII opting for Skill subject along with general education subjects

Theory	60 marks
Practical	40 marks
Total Marks	100 marks

The unit-wise distribution of Periods and marks for Class XII is as follows:

CLASS XII (SESSION 2019-2020)				
	Units	No. of Periods for Theory and Practical 260		Max. Marks for Theory and Practical 100
Part A	Employability Skills			
	Unit 1: Communication Skills – IV	10		10
	Unit 2: Self-management Skills – IV	10		
	Unit 3: Information and Communication Technology Skills – IV	10		
	Unit 4: Entrepreneurial Skills – IV	15		
	Unit 5: Green Skills – IV	05		
	Total	50		10
Part B	Skills	Theory Periods	Practical Periods	
Unit 1	A.C Circuits	10	10	04
Unit 2	Single-Phase Transformer	10	10	08
Unit 3 (A) (B)	D.C. Motors Single Phase A.C. Motor	30	25	08
Unit 4	Three Phase Induction Motors	15	15	04
Unit 5	Measuring Instruments-II	15	10	04
Unit 6	Electrical appliances	30	30	14
	Total	110	100	50
Part C	Practical Work			
	Practical Examination			15
	Written Test			10
	Viva Voce			05
	Total			30
Part D	Project Work/Field Visit			
	Practical File/Student Portfolio			10
	Total			10
	Grand Total			100

4. CONTENTS

CLASS XII (SESSION 2019-2020)

PART A: EMPLOYABILITY SKILLS

	Units
1.	Communication Skills –IV
2.	Self-management Skills –IV
3.	Information and Communication -IV Technology Skills – IV
4.	Entrepreneurial Skills – IV
5.	Green Skills – IV
	Detailed curriculum of Employability Skills is available separately

PART B – SKILLS

1. A.C Circuits

Generation of A.C. voltage, its generation and wave shape. Cycle, frequency, peak value (maximum value), average value, instantaneous value, R.M.S. value, form factor, crest factor, phase, phase difference, power and power factor, A.C. Series Circuits with (i) resistance and inductance (ii) resistance and capacitance and (iii) resistance inductance and capacitance, Q factor of R.L.C. series circuits.

2. Single-Phase Transformer

Types of transformer - step-up and step-down transformer, voltage and current transformer, auto-transformer. Construction, working principles and applications of different types of transformers, rewinding of transformers, cooling of transformers. Safety measures precautions from operational point of view.

3(A) D.C. Motors

Types of motor - series, shunt, compound and universal, construction, working principles, characteristics, winding details and applications of different types of motors including fractional horse power, starting and starters for D.C. motors. Installation of D.C. motor.

(B) Single Phase A.C. Motor

Types of A.C. Motors – induction motor (Split phase and repulsion start), capacitor motor, shaded pole motor, universal motor, construction, working principles, special characteristics, winding details and applications of different types of fractional horse power motors. Starting and starters for different motors.

4. **Three Phase Induction Motors:** Principle, working & starting of three phase induction motor.

5. **Measuring Instruments-II**

Induction type Energy meter analog multi meter, digital multi meter, dynamometer type wattmeter- their circuit connection & application for measurement, operation & application

6. **Electrical appliances:**

(i) Immersion Heater and Geyser:

Construction, working principle and use of immersion heater. Common faults – their causes, testing and repairs. Construction, working principles and use of geyser and thermostat, common defects, their causes, testing and repairs. Testing and installation of geyser. Precautions in using immersion heater and geyser.

(ii) Electric Mixer, Grinder and Blender:

Construction, working principles, characteristics and applications of electric mixer, grinder and blender. Common faults, their causes, testing and repairs, servicing, maintenance and over.

(iii) Room Cooler:

Construction and working details of room cooler, desert cooler, Common cooler faults, their causes, testing and repair, Installation of room cooler/desert cooler.

(iv) Electric Motor Used in Domestic Appliances

Split phase, capacitor start, capacitor-run, shaded-pole motors, two speed motors, reverse motors, universal motors, components testing, trouble shooting, and servicing.

(v) Basic Occupational and Safety Practices

Safety signs, lighting and handling loads, moving heavy equipments, Electrical safety- safety practices- first aid, Practice safe methods- lifting and handling of heavy objects, Rescue a person from live wire, Artificial respiration- Nelson's arm and Schafer's Method.

5. TEACHING ACTIVITIES

The teaching and training activities have to be conducted in classroom, laboratory/ workshops and field visits. Students should be taken to field visits for interaction with experts and to expose them to the various tools, equipment, materials, procedures and operations in the workplace. Special emphasis should be laid on the occupational safety, health and hygiene during the training and field visits.

CLASSROOM ACTIVITIES

Classroom activities are an integral part of this course and interactive lecture sessions, followed by discussions should be conducted by trained teachers. Teachers should make effective use of a variety of instructional or teaching aids, such as audio-video materials, colour slides, charts, diagrams, models, exhibits, hand-outs, online teaching materials, etc. to transmit knowledge and impart training to the students.

PRACTICAL WORK IN LABORATORY/WORKSHOP

Practical work may include but not limited to hands-on-training, simulated training, role play, case based studies, exercises, etc. Equipment and supplies should be provided to enhance hands-on learning experience of students. Only trained personnel should teach specialized techniques. A training plan that reflects tools, equipment, materials, skills and activities to be performed by the students should be submitted by the teacher to the Head of the Institution.

FIELD VISITS/ EDUCATIONAL TOUR

In field visits, children will go outside the classroom to obtain specific information from experts or to make observations of the activities. A checklist of observations to be made by the students during the field visits should be developed by the teachers for systematic collection of information by the students on the various aspects. Principals and Teachers should identify the different opportunities for field visits within a short distance from the school and make necessary arrangements for the visits. At least three field visits should be conducted in a year.

SKILL ASSESSMENT (PRACTICAL)

Assessment of skills by the students should be done by the assessors/examiners on the basis of practical demonstration of skills by the candidate, Practical examination allows candidates to demonstrate that they have the knowledge and understanding of performing a task. This will include hands-on practical exam and viva voce. For practical, there should be a team of two evaluators. The same team of examiners will conduct the viva voce.

Project Work (individual or group project) is a great way to assess the practical skills on a certain time period or timeline. Project work should be given on the basis of the capability of the individual to perform the tasks or activities involved in the project. Projects should be discussed in the class and the teacher should periodically monitor the progress of the project and provide feedback for improvement and innovation. Field visits should be organised as part of the project work. Field visits can be followed by a small-group work/project work. When the class returns from the field visit, each group might be asked to use the information that they have gathered to prepare presentations or reports of their observations. Project work should be assessed on the basis of practical file or student portfolio.

Student Portfolio is a compilation of documents that supports the candidate's claim of competence. Documents may include reports, articles, photos of products prepared by students in relation to the unit of competency.

Viva voce allows candidates to demonstrate communication skills and content knowledge. Audio or video recording can be done at the time of viva voce. The number of external examiners would be decided as per the existing norms of the Board and these norms should be suitably adopted/adapted as per the specific requirements of the subject. Viva voce should also be conducted to obtain feedback on the student's experiences and learning during the project work/field visits.

6. ORGANISATION OF FIELD VISITS/EDUCATIONAL TOURS

In a year, at least 3 field visits/educational tours should be organised for the students to expose them to the activities in the workplace.

7. LIST OF EQUIPMENT AND MATERIAL

1. Work Bench 1.8 m × 1.2 m and 1.5 m × 1.5 m, Heavy duty legs 7.5 cm × 7.5 cm with one 2.5 cm thick top of Shisham and hard wood with spirit polish.

2. Bench Vice –	1 No. 6 each	2 No. 6 each	3 No. 2 each	4 No. 2 each	Size	
3. Pipe Vice : 2 nos., size -	1 No.					
4. Hammers Ball Pien, 100 gms						6 each
Ball Pien, 0.25 kg						6 each
Ball Pien, 0.5 kg						4 each
Ball Pien, 1 kg						2 each
Ball Pien, 2.5 kg						1 No.
5. Mallets of wood different size.						6 each
6. Hammers of Plastic head (Plastic Mallets) of different size						3 each size
7. Micrometer 0 to 25 mm Japanese Mitutoyo.						2 No.
8. Inside Micrometer 5 to 30 mm Japanese Mitutoyo.						2 No.
9. Depth gauge 20 cm Mitutoyo.						1 No.
10. Try Square 15 cm Japanese or English						6 No.
11. Marking Blocks Adjustable						2 sets
12. V. Block 7.5 cm one set with clamp						2 sets
13. Surface plate 45 cm × 45 cm						1 No.
14. Centre Punch 10 cm length						10 No.
15. Wire gauge SWG						1 No.
16. Files of different length, grade and shapes Length (10 cm to 30 cm), Grade Bastered, smooth dead smooth. Shapes flat, Round, Half round, Triangular, Square, knife edge, Mill file, wooden file (Rasp file)						6 each
Needle files of different shapes						3 each
17. Cold Chiesel 15 cm to 20 cm Taparia/Jhalani or other standard make						6 Nos.
18. Drills High speed steel 0.5 mm to 6 mm, 1/6 I.T. Make 6 mm to 18 mm, 1/4" to 3/4"						3 + 3 set 1 + 1 set
19. Crimping Tools						2 No.
20. Diamond Tip Glass Cutter						2 No.
21. Hand Reamers 20 mm or other required size						1 No.
22. Tap sets with handle 1/8" to 3/8" BSW						1 Set
Tap set with handle 3/16" to 3/8" BSF						1 Set
Tap sets with handle 0" to 10" BA						1 Set

23. Dies sets with stocks 1/8" to 3/8" BSW	1 Set
Dies sets with stocks 3/16" to 3/8" BSF	1 Set
Dies sets with stocks 0" to 10" BA	1 Set
24. Screw Driver Non breakable handle Assorted	2 Set
25. Philips Head Screw Driver—Set of 10 Nos.	2 Sets
26. Pliers—Combination Insulated 15 cm, Long Nose, 15 cm, Side Cutting,	
Pliers 15 cm, Flat Nose 15 cm, Round Nose 15 cm	10 Nos. each
Bend Nose 15 cm	2 No
27. Round Nose Seal Remover Pliers 20 cm	2 No.
28. Adjustable Wrench 25 cm–30 cm	2 each
29. Pipe Wrench 25 cm–2.5 cm	2 Nos. each
30. Pipe type spanner set of 8—Spanners—SURA make	1 Set
31. Double End open spanner set of 12 spanners	2 Sets
32. Ring Spanners set of 24 spanners	1 Set
Make Jhalani/Taparia	
33. Box Spanner—set of 24 spanners	1 Set
Make Jhalani/Taparia or imported	
34. T. spanner set from 4 No. to 13 No.	2 Set
35. Allen Key set - Set of 12 pcs.	1 Set
36. Bearing/Pulley Puller	1 No.
37. Grease Gun manual Operated	1 No.
38. Oil cane	1 No.
39. Oil Stove	1 No.
40. Blower Stove	2 No.
41. Scissor 20 cm	6 Nos.
42. Sheet cutter 25 cm Blade length	2 Nos.
43. Rawl Plugs	5 Sets
44. Wooden saw 30 cm to 45 cm	10 Nos.
45. Adjustable Hacksaw	10 Nos.
46. Fix Hacksaw	10 Nos.
47. Junior Saw	2 Nos.
48. Wooden Chisels (Sathari)/ (Chaursi)	10 each
49. Electrician Knife	20 Nos.
50. Photo cutter (9" and 1")	1 each
51. Poker	20 Nos.
52. Scale 15 cm and 30 cm stainless steel Japanese make	10 each

53. Wooden Planer Wood	10 Nos.
Steel Planer (Anant Make)	5 Nos.
54. Wooden Planner for Design for one sided for groove with accessories	2 Sets
55. Phase or Neon tester (Taparia)	20 Nos.
56. Morce Taper Socket 2.3 for drill machine	1 No
57. Soldering Iron 35 Watts to 120 Watts, 35 Watts and 65 Watts (make Raj/Toni)	10 Nos. each
120 Watts (Raj/Toni make)	2 Nos.
15 WAtts	10 Nos.
58. Thermocouple prone type for temp. control	2 Nos.
Thermocouple rod type for temp. control	2 Nos.
59. Bimetallic relay (Faridge and other relays)	2 Nos.
60. Thermostat for refrigerator, for Geysler, for Hot case	2 Nos. each
61. Dynamo D.C. small (Cycle Dynamo)	5 Nos.
62. Universal motor — 1/4 HP and 1/2 HP	1 No. each
63. Soldering Iron stand	20 Nos.
64. Demonstrational Transformer Ratio 1 : 1 230/230 V with 25%, 50%, 85.6% voltage tapping on both side	3 Nos.
65. Air Break Contractor	2 Nos.
66. Voltage Transformer 440 V/110 V	2 Nos.
67. Current transformer 5/100 amps.	2 Nos.
68. Auto Transformer 0 to 270 V 15 amps.single phase AE	2 Nos
69. Electrical Sprayer Pilot—make 800 gram capacity	1 No.
70. D.O.L. Starter—Make GEC, Cromptom, Kirlosker, ABB upto 5 HP 3	3 Nos.
71. Star Delta Starter—Manually operated upto 15 HP	2 Nos.
72. Star Delta Starter—Semi Automatic upto 15 HP	2 Nos.
73. Star Delta Starter—Fully automatic with additional accessories upto 10 HP	2 Nos.
74. Torch of 4 cells portable	2 Nos.
75. Flourescent Tube Fixture with choke and starter complete	10 Nos.
76. Heating Element of different types used in industrial closed type Heating elements as Round Kettle and type other shapes	2 each
77. 3 Phase Reversing switch L & T, other best make	2 each type
78. Rotary Switches of different types as AGI make R 416, R 316, R 216, 216 K, 216 KF, RT 415, R 415 F, R 415 D	2 Nos. each
79. I.C.T.P. and I.C.D.P. Main switches	4 each

80. Distribution Boards	2 Nos.
81. Bus Bar	2 Nos.
82. Old Ceiling fan with complete parts	4 Nos.
83. Old Table fan with complete parts	4 Nos.
84. Exhaust fan with complete parts	4 Nos.
85. Old Shaded pole Motor 1/2 HP	4 Nos
86. Different types of Centrifugal Switch Assembly complete make Crompton/GEC etc.	4 Nos. each
87. Single Phase capacitor start capacitor run Motor	2 Nos.
88. Single Phase 1440 RPM old motor with complete parts	2 Nos.
89. A.C. Induction squirrel cage 3 phase motor 1440 RPM old with complete parts	2 Nos.
90. Hand drill Machine 6 mm capacity	10 Nos.
91. Electrical Gun drill machine-portable 6 mm max. capacity High speed with accessories	1 No.
92. Electrical Gun drill machine portable 12 mm capacity low speed with accessories	1 No.
93. Bench Drill machine pillar type capacity upto 12 mm or 18 mm Taper Drill and 9 mm Drill chuck capacity with all accessories and Drill chuck with key with motor single phase or 3 phase 1 HP as per facility of electricity available in the lab.	1 No.
94. Bench Grinder 1 HP 220 V, Single Phase, Three Phase power 2880 RPM with one smooth and one medium grinding wheel of Carborundum	1 No.
95. Electrical Welding machine upto 250 Amp.capacity single phase 250 Volt AC supply oil filled tank type or air cooled type with all accessories as screen, welding lead and holder, earth clamp etc.	1 Set
96. Winding Machine for Motor coil winding Hand operated	2 Nos.
97. Winding Machine for Transformer winding hand operated single coil	1 No.
98. D.C. Motor series – 1 HP, D.C. Motor Shunt-1 HP RMP 1500	1 No.
D.C. Motor Compound – 1 HP RMP 1500	1 No.
99. A.C. Motor, Single Phase, condenser Start Motor 1/2 HP and 1 HP	1 each
100. Single phase condenser run motor Fractional H.P.	3 Nos.
101. Three Phase Induction Motor 2 HP, 410 V, 1450 RMP	1 No.
102. Shade Pole Motor 1/2 HP, 1/4 HP or small	2 each
103. Demonstrational AC Single phase Squirrel cage induction conden Run F.H.P. Motor all terminal of Motors. Condenser mounted on Bakelite plate of 12 mm thickness fitted with motor on separate Mild Steel Channels	2 Nos.

104. Demonstrational type A.C. Single phase squirrel cage induction condenser start Motor 1/2 HP terminals of running winding, starting winding, condenser and centrifugal switches, mounted on bakelite 12 mm thick plate fitted with motor on separate mild steel channels 2 Nos.
105. Demonstrational Model for study of Transistor circuits (circuit fitted on sun mica 3 mm board with proper terminals I. common base, II. common emitter, III. common collector 2 Nos.
106. Demonstrational Model for study of Transistor Amplifier circuit I common base II common Emitter III common collector. Circuit fitted on sun mica board with proper Terminals 2 Nos.
107. Solenoid coil of copper wire (HTP) Highly insulated bobin (Formula R of coil) made of mica and bakelite operating on 220 V. Copper Wire 29 SWG, length of coil at least 10 cm with two terminals mounted on side of coil. Coil will be fixed on 12 mm ply and sunmica table or 2 mm sunmica Board with 50 cm wooden or plastic rule and Core Material Free Cutting Grade Steel, Cost Iron, Copper, Brass, Aluminium, Carbon Steel one each. 2 Nos.
108. Apparatus for comparison of Aluminium and copper conductivity, resistivity and magnetic field strength. Design-table bedsize 45 cm × 30 cm of 12 mm ply with sunmica/bakelite sheet 3 mm fitted with identical coils (one copper coil wounded and one coil aluminium wounded gauge and turn of wire will be same operating on 220 V one metre rule of wood or plastic will be fitted with screws on both side of coil. Both coils having two terminals on side for connection, core will be permanently fitted inside the coil, core material wrought iron/free cutting grade of steel 2 Nos.
109. Two heating coils wounded on china clay or procelain rod one coil Ureka/ Constantan and one Nichrome wire of same gauge and same wire of length fitted on 30 cm × 38 cm board of bakelite and asbestos sheet fitted on 12 mm Ply board with brass terminal insulated for connection 2 Nos.
110. Half wave rectification model with filer circuit condenser 25 V 1000 MFD transformer 12–0–12 V I amp. output, one 50 VAC Diode 5408 and 6 terminals, fitted on sunmica board with lead and plug 2 Nos.
111. Full wave rectification model with center gap earth and filter circuit. Condenser 25 V/1000 Mfd., Transformer 12–0–12 V Amp. output, two Diode 5408–50 VAC, 6 Terminal fitted on Sunmica Board with lead and plug.
112. Full wave rectification model with full wave rectifier bridge (Bridge of 4 Diode) and II Filter Circuit Transformer 12–0–12 V 1 Amp.output, 4 Diode (No. 5408) 50 VAC Condensor 25 V/1000 Mfd. II Filter Circuit with two condensor and choke of 1 Amp. capacity 6 terminal fitted on Sunmica Board with lead and plug.

B. Measuring Instruments

1. Ammeter MI type 0–5–10 Amps.	4 Nos.
2. Ammeter MC type 0–1–5 Amps.	2 Nos.
3. Voltmeter MI type 0–300 Volts	4 Nos.
4. Voltmeter MI type 0–600 volts	2 Nos.
5. Voltmeter MC type 0–300 volts	2 Nos.
6. Voltmeter MC type 0–15 volts	4 Nos.
7. Watt metre Dynameter type 0–300 5 amp./10 amp.	2 Nos.
8. Energy meter 230 V, 5 amps.	2 Nos.
9. Insulation megger – 500 volts	2 Nos.
10. Earth tester	1 No.
11. Neon tester	2 Nos.
12. Multimeter	2 Nos.
13. Clip on meter	2 Nos.
14. Growler inside and outside	1 No.
15. Phase sequence indicator	2 Nos.
16. Frequency meter Pointer type	1 No.
17. Frequency meter digital type	1 No.
18. Power factor meter	1 No. each
(i) Dimmerstat 230/0–270 V 4 amp.	
(ii) Rheostat (a) 1 amp. 50 ohm, (b) 10 amp. 8 ohm	
(iii) Variable Single Phase Inducter 5/10 amps.	
(iv) Capacitor 50 MF, 400 Volts	
19. Conduct Pipe Tee	6 Nos.
20. Bulbs 60 Watts	1 Dozen

C. Consumable Material

1. P.V.C. wire 3/22	4 coils
2. Wooden Batten 12 mm × 18 mm	100 meter each size
3. Casing Copping (Standard Size)	100 meter
4. Link Clips Standard size	2 Gross

5. Nail Standard size 12 mm	1 Kg
6. Wooden screws standard size	4 Dozen each size
7. Round Blocks standard size	1 Gross
8. Wooden Board standard size	2 Dozen each size
9. Insulation Tape	1 Dozen
10. 5 Amps Switch	2 Dozen
11. 15 Amps Switch	1 Dozen
12. Batton Holder	2 Dozen
13. Pendant Holder	1 Dozen
14. Angle Holder	1 Dozen
15. 5 Amps 2 way switch	1 Dozen
16. Intermediate Switch	6 Nos.
17. 5 Amps 3 pin plug	2 Dozen
18. 15 Amps 3 pin plug	1 Dozen
19. 5 Amps 3 pin shoe	1 Dozen
20. 15 Amps 3 pin shoe	1 Dozen
21. Electric Press Connector	6 Nos.
22. Piano Type Switch Saps	1 Dozen
23. Conduit Pipe 18 mm, 25 mm	50 each
24. Junction Box	6 Nos.
25. Conduit Pipe Tee	6 M Nos.
26. Bulbs 60 Watts	1 Dozen
27. Grease	2 Kg.
28. Lubricating Oil	5 Litre
29. Insulating Varnish	

8. PRACTICAL GUIDELINES

Select minimum 12 to 16 Practical

1. To test and repair a defective cycle dynamo.
2. Dismantling, study and reassembling of a D.C. motor.
3. Measurement of resistance of series, shunt field and armature of a given D.C. motor and identification of terminals by multi meter.
4. Testing, fault finding and repair of a D.C. motor.
5. Overhauling of a D.C. motor.
6. Dismantling, study and reassembling of a D.C. motor starter.
7. Study of (i) Voltage Transformer, (ii) Current Transformer and (iii) Auto-Transformer.

8. To rewind the given 230/12 v transformer.
9. Dismantling, study and reassembling of an A.C. motor.
10. Dismantling, study and reassembling of an A.C. motor starter.
11. Testing, fault finding and repair of an A.C. motor starter.
12. Connecting, starting, running and reversing of an A.C. Universal motor.
13. Installation of D.C. motor.
14. Installation of A.C. motor.
15. Dismantling and reassembling of geyser: (i) instant, (ii) storage.
16. Testing and repair of geyser: (i) storage, (ii) instant.
17. Connection of fluorescent tube-lamp circuit.
18. Testing and repair of: (i) table lamp, (ii) night lamp, (iii) fluorescent tube light.
19. Testing and repair of: (i) electric bell, (ii) buzzer, and (iii) door chimes.
20. To prepare series/parallel testing board.
21. To connect fan regulator with a ceiling fan.
22. To fit MCB in a circuit in place of fuse.
23. Polarity test of installation.
24. Testing, fault finding, repair and overhauling of blower type room heater and heat connector.
25. Testing, fault finding, repair and overhauling of room cooler/desert cooler.
26. Testing, fault finding, repair of emergency light and voltage stabilizer (manual and automatic).
27. Testing, fault finding, repair and overhauling of motors used in domestic appliances.
28. Winding/re-winding of electrical motor used in domestic appliances.
29. To study emergency light circuit.
30. To study speed control, and speed reversal of DC Motors.
31. Start-Stop of 3 phase induction motors
32. Study forward & reverse of 3 phase induction motors
33. Study of analog and digital multimeter and study various parameters
 - (i) Current
 - (ii) Voltage
 - (iii) Resistance
 - (iv) Continuity.
34. Study of power meter and test various loads.

Note:

- The marks for sessional work will be awarded by the teacher concerned and included in the final award.
- Students may be asked to perform any one of the experiments above.

BIS regulations, recommendations and NE pertaining to wiring installation IE regulation related to Earthing. f