Syllabus for LED light Service & Maintenance Technician

Course Name	LED light Service & Maintenance Technician
Sector	Electronics & Hardware
Course Code	ELE/2023/LEDS/200
Level	4
Occupation	LED light Service & Maintenance Technician
Job Description	The LED (Light Emitting Diode) Light Service and Maintenance Technician is responsible for the installation, repair, and maintenance of LED lights in a variety of settings. The technician will be responsible for diagnosing and troubleshooting LED light problems, as well as performing preventive maintenance to keep LED lights operating at peak efficiency.
Course Duration	Total Duration 540 Hrs (T-90, P-240, OJT-150, ES-60)
Trainees' Entry Qualification	12th grade pass OR Completed 2nd year of 3-year diploma (after 10th) and pursuing regular diploma OR 10th grade pass plus 2-year NTC in Mason Trade OR 10th grade pass and pursuing continuous schooling OR 10th Grade Pass with 2 yrs relevant experience OR Previous relevant Qualification of Level 3.0 or equivalent with minimum education as 8th Grade pass OR Previous relevant Qualification of Level 3.5 or Equivalent
Trainers Qualification	BE/B.TECH. / DIPLOMA IN ELECTRICAL ENGINEERING/ ELECTRONICS ENGINEERING OR ITI IN ELECTRICIAN TRADE/ELECTRONICS MECHANIC TRADE, BSC, DIPLOMA IN ELECTRONICS ENGINEERING 2 YEARS FOR B.E./B.TECH. / 3 YEARS FOR DIPLOMA / 5 YEARS FOR ITI,BSC

Structure of Course:

Module No.	Module name	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
1	Basics of Electricity and Electronics	Test and analyse a wide range of electrical parameters and electronics components using appropriate techniques, tools and instruments	10	20	30

Module No.	Module name	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
2	Use of Tools & Soldering Process.	Perform accurate soldering and desoldering processes on electronic components by using proper tools, ensuring proper connections and minimizing damage	10	20	30
3	LED Luminaire design	Design LED luminaires, assessing their performance characteristics and check to meet the specific requirements of diverse applications	25	35	60
4	Assembly of an LED system	Assemble and thoroughly test functional LED light systems, ensuring proper operation and adherence to performance standards	10	20	30
5	Light Testing Methods and Standards	Demonstrate the accurate measurement of luminance and all relevant parameters of light sources, employing various testing standards specifically designed for evaluating LED luminaries	10	20	30
6	LED color quality analysis	Demonstrate colour rendering capabilities and precise colour reproduction capability of a light source.	5	25	30
7	Fault finding & Troubleshooting	Troubleshoot and repair fault in an LED light both at the component level and the strip level.	10	50	60
8	Safe Working Practices	Work effectively at workplace following safe and ethical working practices and good customer relationship.	10	50	60
9	OJT	Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	--	150	150
10	Employability Skill	As per NCVET guided curriculum	60	--	60
TOTAL:			150	390	540

SYLLABUS:

Module No. 1: Basics of Electricity and Electronics

Outcome: Test and analyse a wide range of electrical parameters and electronics components using appropriate techniques, tools and instruments

Theory Content:

1.1 Explain Fundamental of electricity. Electron theory- free electron. Fundamental terms, definitions, units & effects of electric current.

1.2 State the importance of basic laws such as Ohms law, Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL) in electrical installations.

1.3 Explain use of resistors in various electronics circuits and demonstrating colour code

1.4 Explain series parallel connection of R-Circuit.

1.5 Study use of capacitor in circuit, study charging-discharging methods and identifying colour codes.

1.6 Study about L-Circuits, explanation of Faradays Law of Electro Magnetic Induction.

1.7 Explain working principle of semiconductors, diodes, transistors. Explain their types.

1.8 Study on different ICs.

1.9 Explain different function of a multimeter.

1.10 Identify tools and other common equipment, common mechanical and non-mechanical tools.

Practical Content:

1.1 Practice on using measuring instruments in single phase circuit e.g. multi-meter, Wattmeter, Ammeter, Voltmeter, etc.

1.2 Measure current and voltage in electrical circuits to verify Kirchhoff's Laws.

1.3 Check a power supply unit with AC/DC supply using multimeter to find out the voltage/current input/output

1.4 Check and measure resistance capacity, through use of multimeter.

1.5 Check and measure capacitance capacity, through use of multimeter.

1.6 Demonstrate and measure inductors.

1.7 Measure and evaluate diode and transistors through use of multimeter.

1.8 Practising on PCBs / practise boards.

Tools & Equipment needed:

Electric circuit components such as diode, transistor, IC, LED indicator, transformer, resistor, capacitor, thermistor, inductor, PCB, circuit breaker, Multimeter, power source, Ammeter, Voltmeter, Soldering Iron, Soldering wire, De-soldering pump

Module No. 2: Use of Tools & Soldering Process

Outcome: Perform accurate soldering and desoldering processes on electronic components by using proper tools, ensuring proper connections and minimizing damage

Theory Content:

2.1 Discuss and understand the use of Soldering iron and desoldering pump.

2.2 Identify other mechanical tools, used for fastening and other process like tying, buttoning, nailing, locking.

2.2 Study & discuss the soldering and desoldering process.

Practical Content:

2.1 Performing demonstration on how to use soldering iron, soldering flux, for soldering process.
2.2 Performing demonstration on how to use desoldering pump, for desoldering process.
2.3 Use different tools such as Screwdrivers, Allen keys, and others for fastening process.

Tools & Equipment needed:

Soldering station, Pliers, Soldering Flux, Screw Driver Set, Regulated Dc Power Supply, Precision Screw Driver, Wire Stripper, Allen Key Set.

Module No. 3: LED Luminaire design

Outcome: Design LED luminaires, assessing their performance characteristics and check to meet the specific requirements of diverse applications.

Theory Content:

3.1 Explain the use of Light source selection is the process of designing and manufacturing LED light fixtures.
3.2 Study & discuss Optical design, Thermal management, Electrical design, Mechanical design.
3.3 List different types of LED lights, where they are used, their Efficacy, Lifespan and Cost-effectiveness.

Practical Content:

3.1 Demonstrate lighting design plan, by using Lux meter.
3.2 Show how to Test different light sources.
3.3 Show how to use different diodes and LEDs for different purposes.
3.4 Show how to measure Luminance & Illuminance.

Tools & Equipment needed:

LUX meter, transistor, LEDs of different colors.

Module No. 4: Assembly of an LED system

Outcome: Assemble and thoroughly test functional LED light systems, ensuring proper operation and adherence to performance standards

Theory Content:

4.1 Show how to gather the necessary components. This includes the LEDs, resistors, capacitors, diodes, and any other electronic components that are needed.

4.2 Show how to assemble the circuit. This involves connecting the components together in the correct order.
4.3 Discuss and understand how to diagnose an LED circuit by a visual inspection. This involves looking for any obvious signs of damage, such as broken components, loose connections, or burned wires.
4.4 Demonstrate on how to use high-quality components to ensure that the circuit is reliable and long-lasting.

Practical Content:

4.1 Demonstrate preparation of the components.
4.2 Performing demonstration on how to place the components in the correct order and position on the printed circuit board (PCB).
4.3 Demonstrate how to visually inspect a faulty LED panel, Strip, or PCB.
4.4 Demonstrate how to use a digital multimeter to measure the voltage, current, and resistance of the LED circuit.
4.5 Demonstrate burn test, in-circuit test & functional testing of LED light source and components for problems that are not easily visible with a multimeter.

Tools & Equipment needed:

Multimeter, Soldering iron, Solder, Wire strippers, Wire cutters, Breadboard, Pliers.

Module No. 5: Light Testing Methods and Standards

Outcome: Demonstrate the accurate measurement of luminance and all relevant parameters of light sources, employing various testing standards specifically designed for evaluating LED luminaries.

Theory Content:

5.1 Discuss and understand Luminous flux. This is the total amount of light emitted by a light source. It is measured in lumens.
5.2 Discuss and understand Luminous efficacy. This is the ratio of luminous flux to electrical power. It is measured in lumens per watt.
5.3 Show how to gather the necessary information on organizations such as the International Electrotechnical Commission (IEC), the Illuminating Engineering Society (IES), and the American National Standards Institute (ANSI).
5.4 Describe details on IES LM-80, IES LM-82, IES LM-84, ANSI/UL 1598 etc.

Practical Content:

5.1 Demonstrate use of LUX meter.
5.2 Performing demonstration on how to determine the spectral distribution of light.
5.3 Show how to diagnose and measures the amount of light that is emitted by a source
5.4 Show how to measure the luminance of a light source, a photometer measures the luminous flux of a light source and converts it into luminance.

Tools & Equipment needed:

Digital Multimeter, Lux meter, Light standard charts.

Module No. 6: LED color quality analysis

Outcome: Demonstrate colour rendering capabilities and precise colour reproduction capability of a light source.

Theory Content:

6.1 Demonstrate colour quality of an LED by determining its spectral power distribution (SPD)
6.2 Demonstration on different methods for evaluating LED colour quality, such as Colour Rendering Index (CRI). The CRI is a scale from 0 to 100, with 100 being the highest possible score.
6.3 Discuss other methods for evaluating LED colour quality include the Colour Consistency Index (CCI), the Colour Rendering Index for Television (CRI-T), and the Daylight Simulation Index (DSI).
6.4 Show how to visually inspect the simplest method for evaluating LED colour quality. It involves simply looking at the LED light source and comparing its colour output to a reference light source.
6.5 Discuss quantitative methods such as the CRI and CCT.

Practical Content:

6.1 Demonstrate how accurately an LED light source renders the colours of objects compared to a reference light source, such as incandescent light. A CRI of 100 is the highest possible rating, and a CRI of 80 or higher is considered to be good.
6.2 Demonstrate that colour temperature is a measure of the warmth or coolness of a light source. It is measured in Kelvin (K). A colour temperature of 2700K is considered to be warm, while a colour temperature of 6500K is considered to be cool.
6.3 Demonstrate and show colour gamut an LED light source can produce. A wider colour gamut means that the LED light source can produce more vibrant and saturated colours.
6.4 Show how to check colour uniformity. A high colour uniformity means that the colours are evenly distributed, while a low colour uniformity means that the colours are not evenly distributed.

Tools & Equipment needed:

Digital Multimeter, Lux meter, CRI charts, CCT charts, LED Street Light, LED Tube light, LED Bulb.

Module No. 7: Fault finding & Troubleshooting

Outcome: Troubleshoot and repair fault in an LED light both at the component level and the strip level.

Theory Content:

7.1 Show how to check the power supply. Make sure that the power supply is providing the correct voltage and current for the LED light.

7.2 Show and demonstrate how to check the LEDs. Use a multimeter to measure the voltage drop across each LED. If the voltage drop is too low, the LED is burned out.
7.3 Discuss and check the LED driver. If the power supply and the connections are okay, the problem may be with the LED driver.
7.4 Study and gather knowledge on LED driver, IC connections and micro processing unit of the circuit.
7.5 Show how to identify and replace the faulty part and understand the internal circuit theory of the PCB design to arrange an alternative if the required faulty part's substitution is not available.
7.6 Show how to Replace the LED light. If the LED light is not working, replacement is the only solution.

Practical Content:

7.1 Demonstrate how to check the power supply. Make sure that the power supply is providing the correct voltage and current to the LED light. Use of multimeter to measure the voltage and current at the LED light's terminals.
7.2 Demonstrate how to check the LED light itself. If the power supply is providing the correct voltage and current, then the LED light itself may be faulty. Testing the LED light using a multimeter. If the LED light is not conducting current, then it is faulty and needs to be replaced.
7.3 Express and thoroughly check the wiring. Make sure that the wiring between the power supply and the LED light is not damaged. If the wiring is damaged, then it will need to be repaired or replaced.
7.4 Explain why it is important to use the right tools. Demonstrate why multimeter is an essential tool for troubleshooting LED lights. It can be used to measure the voltage, current, and resistance of the LED light.
7.5 Show how to check the connections. Make sure that the connections between the power supply, the LED light, and the wiring are secure. If the connections are loose, then they will need to be tightened.

Tools & Equipment needed:

Digital Multimeter, Soldering station, Wire stripper, magnifying glass, Pliers, safety glasses

Module No. 8: Safe Working Practices

Outcome: Work effectively at workplace following safe and ethical working practices and good customer relationship.

Theory Content:

8.1 State the importance of work ethics and workplace etiquette.
8.2 Study & discuss the common reasons for interpersonal conflict and ways of managing them effectively. And the importance of following organizational guidelines for dress code, time schedules, language usage and other behavioural aspects.
8.3 Explain the common workplace guidelines and legal requirements on non-disclosure and confidentiality of business-sensitive information.
8.4 Describe the concept of waste management and methods of disposing hazardous waste.
8.5 Explain various warning and safety signs & describe different ways of preventing accidents at the workplace.
8.6 Explain the organizational safety procedures for maintaining electrical safety, handling tools and hazardous materials

Practical Content:

8.1 Develop a sample plan to achieve organisational goals and targets.
8.2 Role-play to demonstrate the use of professional language and behaviour that is respectful to all genders.
8.3 Apply organizational protocol on data confidentiality and sharing only with the authorized personnel.
8.4 Demonstrate the use of protective equipment suitable as per tasks and work conditions.
8.5 Prepare a report to inform the relevant authorities about any abnormal situation/behaviour of any equipment/system.
8.6 Demonstrate the steps to free a person from electrocution safely.
8.7 Demonstrate the application of defined emergency procedures such as raising alarm, moving injured people, etc.

Tools & Equipment needed:

Sample of Escalation Matrix, Organization Structure, Personal Protection Equipment, Safety Cotton Gloves, Safety Footwear, Warning Signs and Tape, First Aid Kit.

Module No. 9 : OJT

Outcome:
Work in real job situation with special emphasis on basic safety and hazards in this domain

Practical Content:
Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for **150 Hours**.)

Module No. 10 : Employability Skills

Key Learning Outcomes

Introduction to Employability Skills Duration: 1.5 Hours

1. Discuss the Employability Skills required for jobs in various industries
2. List different learning and employability related GOI and private portals and their usage

Constitutional values - Citizenship Duration: 1.5 Hours

3. Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
4. Show how to practice different environmentally sustainable practices.

Becoming a Professional in the 21st Century Duration: 2.5 Hours

5. Discuss importance of relevant 21st century skills.
6. Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life.
7. Describe the benefits of continuous learning.

Basic English Skills Duration: 10 Hours

8. Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone
9. Read and interpret text written in basic English
10. Write a short note/paragraph / letter/e -mail using basic English

Career Development & Goal Setting Duration: 2 Hours

11. Create a career development plan with well-defined short- and long-term goals

Communication Skills Duration: 5 Hours

12. Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette.
13. Explain the importance of active listening for effective communication
14. Discuss the significance of working collaboratively with others in a team

Diversity & Inclusion Duration: 2.5 Hours

15. Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD
16. Discuss the significance of escalating sexual harassment issues as per POSH act.

Financial and Legal Literacy Duration:5 Hours

17. Outline the importance of selecting the right financial institution, product, and service
18. Demonstrate how to carry out offline and online financial transactions, safely and securely

19. List the common components of salary and compute income, expenditure, taxes, investments etc.
20. Discuss the legal rights, laws, and aids

Essential Digital Skills Duration: 10 Hours

21. Describe the role of digital technology in today's life
22. Demonstrate how to operate digital devices and use the associated applications and features, safely and securely
23. Discuss the significance of displaying responsible online behavior while browsing, using various social media platforms, e-mails, etc., safely and securely
24. Create sample word documents, excel sheets and presentations using basic features
25. utilize virtual collaboration tools to work effectively

Entrepreneurship Duration: 7 Hours

26. Explain the types of entrepreneurship and enterprises

27. Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan
28. Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement
29. Create a sample business plan, for the selected business opportunity

Customer Service Duration: 5 Hours

30. Describe the significance of analyzing different types and needs of customers
31. Explain the significance of identifying customer needs and responding to them in a professional manner.
32. Discuss the significance of maintaining hygiene and dressing appropriately

Getting Ready for apprenticeship & Jobs Duration: 8 Hours

33. Create a professional Curriculum Vitae (CV)
34. Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively
35. Discuss the significance of maintaining hygiene and confidence during an interview
36. Perform a mock interview
37. List the steps for searching and registering for apprenticeship opportunities

Learning Outcome – Assessment Criteria

Module No.	Learning Outcome	Assessment Criteria
1	Test and analyse a wide range of electrical parameters and electronics components using appropriate techniques, tools and instruments	**After completion of this module students will be able to:** 1.1 Recognize the various electronics components such as resistors, capacitors, diodes, transistors. 1.2 Select suitable testing tools and instruments based on the type of electronic components. 1.3 Apply testing techniques to test the parameters of AC/DC Current & Voltage 1.4 Use proper tools to measure voltage, current, resistance and other electrical parameters accurately. 1.5 Follow relevant industry standards and guidelines for testing electronic components and parameters. 1.6 Test and evaluate the functionality of diode and transistors.

Module No.	Learning Outcome	Assessment Criteria
2	Perform accurate soldering and desoldering processes on electronic components by using proper tools, ensuring proper connections and minimizing damage	**After completion of this module students will be able to:** 2.1 Recognize various electronic components and their soldering and desoldering requirements. 2.2 Choose the correct soldering iron, solder, flux, desoldering tools and other components. 2.3 Demonstrate the safe handling practices for soldering and desoldering. 2.4 Develop the ability to visually inspect solder joints for defects and ensure they meet industry standards for quality and reliability.
3	Design LED luminaires, assessing their performance characteristics and check to meet the specific requirements of diverse applications	**After completion of this module students will be able to:** 3.1 Demonstrate the key components of LED luminaires. 3.2 Describe lighting principles, color theory and the behaviour of LEDs to effectively design luminaires with desired lighting outcomes. 3.3 Analyze diverse lighting application scenarios. 3.4 Develop strategies for optical design, thermal management, electrical design and mechanical design within LED luminaires, ensuring optimal performance 3.5 Implement rigorous testing procedures to measure and assess the luminous flux, color rendering, color temperature, and other performance metrics of LED luminaires.
4	Assemble and thoroughly test functional LED light systems, ensuring proper operation and adherence to performance standards	**After completion of this module students will be able to:** 4.1 Identify various components required for assembling LED light systems. 4.2 Select appropriate components based on the specifications and requirements of the LED light system, considering factors like color temperature, brightness, and power consumption 4.3 Demonstrate effective techniques for soldering, wiring and mechanical assembly to ensure secure and reliable connections between components 4.4 Place the components in the correct order and position on the PCB 4.5 Create clean and organized wiring and interconnections between components to minimize signal loss, electromagnetic interference and potential failures. 4.6 Develop comprehensive testing procedures to evaluate the LED light system's performance

Module No.	Learning Outcome	Assessment Criteria
		characteristics, including light output, color accuracy, efficiency and reliability. 4.7 Identify and rectify any issues that arise during the assembly and testing process, ensuring proper functionality.
5	Demonstrate the accurate measurement of luminance and all relevant parameters of light sources, employing various testing standards specifically designed for evaluating LED luminaries	**After completion of this module students will be able to:** 5.1 Describe Luminous flux and Luminous efficacy. 5.2 Operate luminance meters, LUX meter with their working principle. 5.3 Explain how measurement geometry and angle of illumination impact luminance measurements. 5.4 Identify LED specific parameters like correlated color temperature shift, spectral characteristics and flicker etc. 5.5 Describe how to determine the spectral distribution of light. 5.6 Evaluate LED luminaries' performance characteristics based on measure luminance data.
6	Demonstrate colour rendering capabilities and precise colour reproduction capability of a light source.	**After completion of this module students will be able to:** 6.1 Describe the concept of colour rendering and its importance in accurately representing colours under different light sources. 6.2 Demonstrate the colour quality of an LED by determining its spectral power distribution. 6.3 explain various colour quality metrics such as Colour Rendering Index (CRI). 6.4 Demonstrate the ability to accurately determine and analyse the colour temperature of LED light sources using colour temperature measurement techniques. 6.5 Analyse the colour fidelity of LEDs by comparing the spectral characteristics of the light source to a reference source, identifying shifts and discrepancies. 6.6 Evaluate the uniformity of colour across different areas of an LED light source and identify any variations or deviations from the intended colour

Module No.	Learning Outcome	Assessment Criteria
7	Troubleshoot and repair fault in an LED light both at the component level and the strip level.	**After completion of this module students will be able to:** 7.1 Identify different components within an LED light, including LEDs, resistors, capacitors, drivers, connectors and other essential parts. 7.2 Follow systematic fault diagnosis methodologies to identify and isolate issued within an LED light. 7.3 Use digital multimeters to measure voltage, current, resistance and continuity in LED circuits, aiding in fault detection. 7.4 Repair or replace faulty components at the component level, ensuring secure connections and proper functionality. 7.5 Demonstrate the ability to test individual LEDs for functionality, colour consistency, and proper voltage/current characteristics 7.6 Develop techniques to troubleshoot and identify faults at the LED strip level, including open circuits, short circuits, or uneven illumination 7.7 Measure and analyse voltage and current levels at different points in the circuit to identify deviations from expected values. 7.8 Develop skills in tracing the flow of current through an LED circuit, identifying potential points of failure and areas requiring attention 7.9 Develop strategies for efficient and effective repair, including component replacement, reflow soldering and PCB trace repair

Module No.	Learning Outcome	Assessment Criteria
8	Work effectively at workplace following safe and ethical working practices and good customer relationship.	**After completion of this module students will be able to:** 8.1 Explain the importance of work ethics and workplace etiquette. 8.2 Describe the common reasons for interpersonal conflict and way to manage them. 8.3 Follow the common workplace guidelines and legal requirements on non-disclosure and confidentiality of business sensitive information. 8.4 Describe the concept of waste management and methods of disposing hazardous waste. 8.5 Develop a sample plan to achieve organisational goal. 8.6 Apply safe working practices. 8.7 Demonstrate the uses of PPE 8.8 Demonstrate the procedure for emergency situation viz. electrocution etc and application of raising alarm, moving injured people etc. 8.9 Interpret general health and safety guidelines labels, charts, sign ages 8.10 Communicate general health and safety guidelines to colleagues/co-workers
9	OJT	Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for 150 Hours.)
10	Employability Skill	As per NCVET guided curriculum

List of Tools, Equipment & materials needed for 30 Trainees

Sl No	Items Name	Specification	Qty (in Nos)
1	Wire Stripper	Standard	5
2	Soldering Station	Standard	5
3	Soldering Flux	Standard	2
4	Screw Driver Set	Standard	5
5	Regulated Dc Power Supply	Standard	2
6	Precision Screw Driver	Standard	5
7	Plier	Standard	5
8	Lux Meter	Standard	2
9	LED Tubelight	Standard	5
10	LED Street Light	Standard	5
11	ESD Wrist Band	Standard	5
12	ESD Mat	Standard	2
13	ESD Gloves	Standard	5
14	Digital Multimeter	Standard	5
15	Connecting Wires	Standard	50
16	Allen Key Set	Standard	5
17	Ac Power Source	Standard	5
18	9-Watt LED Lights	Standard	5
19	7-Watt LED Lights	Standard	5
20	5-Watt LED Lights	Standard	5
21	3-Watt LED Lights	Standard	5
22	12-Watt LED Lights	Standard	5
23	Safety Shoes	Standard	5
24	Safety Helmet	Standard	5

Marks Distribution

Outcome	Outcome Code	Total Th marks	Total Pr marks
Test and analyse a wide range of electrical parameters and electronics components using appropriate techniques, tools and instruments	ELE/1019/OC1	20	50
Perform accurate soldering and desoldering processes on electronic components by using proper tools, ensuring proper connections and minimizing damage	ELE/1019/OC2	20	50
Design LED luminaires, assessing their performance characteristics and check to meet the specific requirements of diverse applications	ELE/1019/OC3	20	80

Outcome	Outcome Code	Total Th marks	Total Pr marks
Assemble and thoroughly test functional LED light systems, ensuring proper operation and adherence to performance standards	ELE/1019/OC4	20	50
Demonstrate the accurate measurement of luminance and all relevant parameters of light sources, employing various testing standards specifically designed for evaluating LED luminaries	ELE/1019/OC5	20	50
Demonstrate colour rendering capabilities and precise colour reproduction capability of a light source.	ELE/1019/OC6	10	70
Troubleshoot and repair fault in an LED light both at the component level and the strip level.	ELE/1019/OC7	20	80
Work effectively at workplace following safe and ethical working practices and good customer relationship.	ELE/1019/OC8	20	70
Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	ELE/1019/OC9	0	300
Employability Skill-60 Hrs	DGT/VSQ/N0102	50	0