QUALIFICATION FILE

Assistant Technician- Electrical

☐ Short Term Training (STT) ☑ Long Term Training (LTT) ☐ Apprenticeship
☐ Upskilling ☐ Dual/Flexi Qualification ☐ For ToT ☐ For ToA

☑ General ☐ Multi-skill (MS) ☐ Cross Sectoral (CS) ☐ Future Skills ☐ OEM

NCrF / NSQF Level: 3.5

Submitted By:

NETTUR TECHNICAL TRAINING FOUNDATION
23/24, II PHASE, PEENYA INDUSTRIAL AREA,
BENGALURU – 560058, KARNATAKA

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Section 1: Basic Details

1.	**Qualification Name**	**Assistant Technician - Electrical**	
2.	**Sector/s**	**Electrical and Electronics**	
3.	**Type of Qualification: ☑ New ☐ Revised** **☐ Has Electives/Options ☐ OEM**	**NQR Code & version of existing/previous qualification:** *(change to previous, once approved)*	**Qualification Name of existing / ~~previous~~ version:** Assistant Technician Electrical
4.	**a. OEM Name** ***b.*** **Qualification Name**(*Wherever applicable)*	NA	
5.	**National Qualification Register (NQR) Code &Version** (*Will be issued after NSQC approval)*	QG-3.5-EH-01404-2023-V1-NTTF	**6. NCrF /NSQF Level: 3.5**
7.	**Award (Certificate/Diploma/Advance Diploma/ Any Other** (*Wherever applicable specify multiple entry/exits also & provide details in annexure)*	Certificate	
8.	**Brief Description of the Qualification**	Perform different types of Electrical wirings for different applications. Perform simple machining operations. Job Holder can Rig up Single Phase AC Circuit wiring for lights and other appliances. Soldering of thimbles to stranded wires and Crimping of Thimbles. The subjects covered in this Programme are – English, Mathematics, Applied science, Electronics, Electrical Engineering, Analog Electronics, Electrical Circuit Analysis, Electrical Material Science, Employability Skill, Applied Science Lab, Electronics Lab, Electrical Engineering Lab, Engineering Drawing/ Fusion 360, Workshop, Basics of Computer Lab, Analog Electronics Lab Electrical Circuit Analysis Lab, Electrical CAD Lab, Electrical Wiring Lab, OJT	
9.	**Eligibility Criteria for Entry for Student/Trainee/Learner/Employee**		

S. No.	Academic/Skill Qualification (With Specialization - if applicable)	Required Experience (with Specialization - if applicable)
01	Minimum 10th Pass OR 8th standard + 2 years ITI as Electrician, Electrician Power Distribution OR	NA

			8th pass + Skill Level 3.0 in relevant trade	
10.	**Credits Assigned to this Qualification, Subject to Assessment** *(as per National Credit Framework (NCrF))*	**Total Credits – 40**	**11. Common Cost Norm Category (I/II/III)** *(Wherever applicable)*:	**NA**
12.	**Any Licensing requirements for Undertaking Training on This Qualification** *(wherever applicable)*	**NA**		
13.	**Training Duration by Modes of Training Delivery** *(Specify **Total Duration** as per selected training delivery modes and as per requirement of the qualification)*	☐ **Offline** ☐ **Online** ☑ **Blended**		

Training Delivery Modes	Theory (Hours)	Practical (Hours)	OJT/ Project Mandatory (Hours)	OJT Recommended (Hours)	Total (Hours)
Classroom (offline)	480	570	90	NIL	1140
Online	60	-	-	-	60

(Refer Blended Learning Annexure for details)

14.	**Aligned to NCO/ISCO Code/s** *(if no Code is available mention the same)*	NCO Code –2015/3113.0101, 2025/3113.3900
15.	**Progression path after attaining the qualification.** *(Please show Professional and Academic progression)*	**Professional Progression:** After Completion of 1 year of Full Time Programme can work as Assistant Technician Electrical After Completion of 3 years of Full Time Programme and after 5 years of Industry Experience the Job Holder can work as R&D Power Engineer, Power distribution Service Engineer, Power distribution Maintenance Engineer, Engineer Renewable energy and Engineer power distribution. **Academic Progression:** Advance Certificate - Technician-Industrial Electrical (Level 4.0), Diploma in Electrical & Electronics Engineering (Level 4.5), Post Diploma, B. VoC and B.Tech Degree Course in Relevant field. After Completion of 3 years of Full Time Programme and after 3 years of Industry Experience the Job Holder **Vertical Progression:** Technician - Senior Technician - Engineer - Supervisor – Manager
16.	**Other Indian languages in which the Qualification & Model Curriculums are being submitted**	Hindi

17.	**Is similar Qualification(s) available on NQR-if yes, justification for this qualification**	**☐ Yes ☑ No URLs of similar Qualifications: NA**	
18.	**Is the Job Role Amenable to Persons with Disability**	**☐ Yes ☑ No If "Yes", specify applicable type of Disability**	
19.	**How Participation of Women will be Encouraged**	**Yes** - Admission open to women candidates (30% seats reserved)	
20.	**Are Greening/ Environment Sustainability Aspects Covered (Specify the NOS/Module which covers it)**	**☐ Yes ☑ No**	
21.	**Is Qualification Suitable to be Offered in Schools/Colleges**	**Schools ☐ Yes ☑ No Colleges ☐ Yes ☑ No**	
22.	**Name and Contact Details of Submitting / Awarding Body SPOC** *(In case of CS or MS, provide details of both Lead AB & Supporting ABs)*	**Name: Mr. R Rajagopalan** Position in the Organization: **Joint Managing Director** **Email:** rg@nttf.co.in Tel number: 080 - 28390215 **Contact Number:** 9844013448 **Website: nttftrg.com**	
23.	**Final Approval Date by NSQC: 30 Nov 2023**	**24. Validity Duration: 3 Years**	**25. Next Review Date: 30 Nov 2026**

Section 2: Module Summary

NOS/s of Qualifications *(In exceptional cases these could be described as components)*

Mandatory Modules/NOS/s: Specify the training duration and assessment criteria at NOS/ Module level. For further details refer to the curriculum document - In Annexure

Th*.-Theory* ***Pr.****-Practical* ***OJT****-On the Job* ***Man.****-Mandatory Training* ***Rec.****-Recommended* ***Proj.*** *-Project*

Sl. No.	NOS/Module Name	NOS/ Module Code & Version	Core/ Non-Core	NCrF/ NSQF Level	Credits as per NCrF	Training Duration (Hours)					Assessment Marks					
						Th.	Pr.	OJT-Man.	OJT-Rec.	Total	Th.	Pr.	Proj.	Viva	Total	Weightage (%) *(if applicable)*
Semester – 1																
1	Communication English-I	CP23101T	Core	3.5	20	60	-	-	-	60	62.5	-	-	37.5	100	
2	Applied Mathematics-I	CP23102T	Core	3.5		60	-	-	-	60	100	-	-	-	100	
3	Applied science	CP23103T	Core	3.5		40	-	-	-	40	100	-	-	-	100	
4	Electronics	CP23104T	Core	3.5		40	-	-	-	40	100	-	-	-	100	
5	Electrical Engineering	CP23105T	Core	3.5		40	-	-	-	40	100	-	-	-	100	
6	Applied Science Lab	CP23106P	Core	3.5		-	30	-	-	30	-	80	-	20	100	
7	Electronics Lab	CP23107P	Core	3.5		-	60	-	-	60	-	80	-	20	100	
8	Electrical Engineering Lab	CP23108P	Core	3.5		-	60	-	-	60	-	80	-	20	100	
9	Engineering Drawing/ Fusion 360	CP23109P	Core	3.5		-	60	-	-	60	-	80	-	20	100	
10	Workshop	CP23110P	Core	3.5		-	80	-	-	80	-	80	-	20	100	
11	Basics of Computer Lab	CP23111P	Core	3.5		-	40	-	-	40	-	80	-	20	100	
12	Employability Skill	CP23112T	Core	3.5		30	-	-	-	30	75	-	-	25	100	
Duration (in Hours) / Total Marks					**20**	**270**	**330**	**-**	**-**	**600**	**537.5**	**480**	**-**	**182.5**	**1200**	
Semester – 2																
13	Communication English-II	CP23201T	Core	3.5		40	-	-	-	40	62.5	-	-	37.5	100	
14	Applied Mathematics-II	CP23202T	Core	3.5		40	-	-	-	40	100	-	-	-	100	
15	Analog Electronics	CP23203T	Core	3.5		60	-	-	-	60	100	-	-	-	100	
16	Electrical Circuit Analysis	CP23204T	Core	3.5		60	-	-	-	60	100	-	-	-	100	
17	Electrical Material Science	CP23205T	Core	3.5		40	-	-	-	40	100	-	-	-	100	
18	Analog Electronics Lab	CP23206P	Core	3.5		-	60	-	-	60	-	80	-	20	100	
19	Electrical Circuit Analysis Lab	CP23207P	Core	3.5		-	60	-	-	60	-	80	-	20	100	

20	Electrical CAD Lab	CP23208P	Core	3.5	20	-	40	-	-	40	-	80	-	20	100	
21	Workshop	CP23209P	Core	3.5		-	30	-	-	30	-	80	-	20	100	
22	Electrical Wiring Lab	CP23210P	Core	3.5		-	50	-	-	50	-	80	-	20	100	
23	Employability Skill	CP23211T	Core	3.5		30	-	-	-	30	75	-	-	25	100	
24	OJT	CP23212P	Core	3.5		-	-	90	-	90	-	75	-	25	100	
Duration (in Hours) / Total Marks					**20**	**270**	**240**	**90**	**-**	**600**	**537.5**	**475**	**-**	**187.5**	**1200**	
Total					**40**	**540**	**570**	**90**	**-**	**1200**	**1075**	**955**	**-**	**370**	**2400**	**-**

Elective Modules/NOS/s: NA

Sl. No.	NOS/Module Name	NOS/Module Code & Version *(if applicable)*	Core/ Non-Core	NCrF/NSQF Level	Credits as per NCrF	Training Duration (Hours)					Assessment Marks					
						Th.	Pr.	OJT-Man.	OJT-Rec.	Total	Th.	Pr.	Proj.	Viva	Total	Weightage (%) *(if applicable)*
1.																
2.																
Duration (in Hours) / Total Marks																

Optional Modules/NOS/s: NA

Sl. No.	NOS/Module Name	NOS/Module Code & Version *(if applicable)*	Core/ Non-Core	NCrF/NSQF Level	Credits as per NCrF	Training Duration (Hours)					Assessment Marks					
						Th.	Pr.	OJT-Man.	OJT-Rec.	Total	Th.	Pr.	Proj.	Viva	Total	Weightage (%) *(if applicable)*
1.																
2.																
Duration (in Hours) / Total Marks																

Assessment - Minimum Qualifying Percentage

*Please specify **any one** of the following:*

Minimum Pass Percentage: *(Every Trainee should score specified minimum aggregate passing percentage at qualification level to successfully clear assessment)*

Minimum 40% in each Theory module, 50% in each Practical module and 60% in Project

Section 3: Training Related

1.	**Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	Diploma in relevant field with 3 years as trainer or industry experience B. Tech or BE with 2 years trainer or Industry experience
2.	**Master Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	Diploma in relevant field with 5 years as trainer or industry experience B. Tech or BE with 5 years of trainer + industry experience
3.	**Tools and Equipment Required for Training**	☑ Yes ☐ No (*If "Yes", details to be provided in Annexure)*
4.	**In Case of Revised Qualification, Details of Any Upskilling Required for Trainer**	**NA**

Section 4: Assessment Related

1.	**Assessor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	Diploma with 4 years as trainer or industry experience B. Tech or BE with 3 years as trainer or industry experience
2.	**Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	Diploma or B. Tech or BE with 2 years of experience
3.	**Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	Diploma with 4 years as trainer or industry experience B. Tech or BE with 3 years as trainer or industry experience
4.	**Assessment Mode** *(Specify the assessment mode)*	Blended theory (online and offline in the center) and practical
5.	**Tools and Equipment Required for Assessment**	Same as for training ☑ Yes ☐ No *(details to be provided in Annexure-if it is different for Assessment)*

Section 5: Evidence of the need for the Qualification

Provide Annexure/Supporting documents name.

1.	**Research Reports:** The following reports establish the Skilled Resource requirement for the Electrical and Electronics Engineering, 1. MSDE Annual Report 2021- 2022 predicts skilled manpower requirement in the Power and Renewable energy sectors. 2. Annual report 2021-22 from Ministry of new and Renewable Energy has projected requirement of skilled manpower in the area. 3. Annual report 2021- 2022 Ministry of Power has projected energy demand for various sectors. The above two will lead to Higher requirement in Electrical and Electronics Engineers in large numbers in the Future. 4. Annual reports 2021 – 22 of Ministry of Heavy Industries Government of India The above Studies has found Higher growth in Manufacturing, Capital Goods and Automotive Industries which will require Qualified Technicians in Electrical and Electronics skills.
2.	**Latest Market Research Reports or any other source (not older than 2 years) (Yes/No):** The following reports establish the Skilled Resource requirement for the Manufacturing, Capital Goods and Automotive Industries 1. Indian Skills Report 2021-22 by **Wheebox** - partnered **CII** predicts skill requirement in Engineering and Manufacturing sectors and Energy and Core sectors. 2. NASSCOM, FICCI and EY report on **Future of Jobs in India 2022 -** Perspective predicts higher growth in Component Manufacturing and Automotive sector.
3.	**Government /Industry initiatives/ requirement (Yes/No): YES –** 1. Study on Job Role of the Future by Indian Institute of Skills. 2. National Policy for skill Development and Entrepreneurship 2015 by MSDE has predicted skilled manpower requirement across key sectors by 2022 and has framed many initiatives.
4.	**Number of Industry validation provided: 33**
5.	**Estimated nos. of persons to be trained and employed: 250 / year**
6.	**Evidence of Concurrence/Consultation with Line Ministry/State Departments:** (Letter to be sent to the concerned ministry and copy attached) If “No”, why: Under Process.

Section 6: Annexure & Supporting Documents Check List

Specify Annexure Name / Supporting document file name

1.	**Annexure 1:** NCrF/NSQF level justification based on NCrF level/NSQF descriptors (Mandatory)	Yes
2.	**Annexure 2:** List of tools and equipment relevant for qualification (Mandatory, except in case of online course)	Yes
3.	**Annexure 3:** Industry Validations Summary	Yes
4.	**Annexure 4:** Training & Employment Details	Yes
5.	**Annexure 5:** Blended Learning (Mandatory, in case selected Mode of delivery is "Blended Learning")	Yes
6.	**Annexure 6:** Detailed Assessment Criteria (Mandatory)	Yes
7.	**Annexure 7:** Assessment Strategy (Mandatory)	Yes
8.	**Annexure 13:** Multiple Entry-Exit Details (Mandatory, in case qualification has multiple Entry-Exit)	No
9.	**Annexure:** Acronym and Glossary (Optional)	Yes
10.	**Supporting Document:** Model Curriculum (Mandatory – Public view)	Digital content available to trainees through Edusquares ERP (Will be made public after the qualification is approved) Annexure-8
11.	**Supporting Document:** Career Progression (Mandatory - Public view)	Yes (Annexure-9)
12.	**Supporting Document:** Occupational Map (Mandatory)	Yes (Annexure-11)
13.	**Supporting Document:** Assessment SOP (Mandatory)	Yes (Annexure-10)
14.	**Supporting Document:** Key Learning Outcome	Yes (Annexure-12)
15.	**Any other document you wish to submit**	No

Annexure 1: Evidence of Level

NCrF/NSQF Level Descriptors	Key requirements of the job role/ outcome of the qualification	How the job role/ outcomes relate to the NCrF/NSQF level descriptor	NCrF/NSQF Level
Professional Theoretical Knowledge/Process	Explain Electrical safety. Practice Basic Engineering Mathematics. Explain of operating procedures of different Electronics and Electrical measuring tools and equipments. Describe functioning of basic Electronics components. Explain Circuit protection devices. Explain DC sources, Single phase and three phase AC Sources. State and explain laws governing Electrical and Electronics Circuits. Explain the working of different Electrical machines. Describe the properties and applications of conducting materials and Alloys, semi conducting materials, Di-electric materials.	Identify the Electrical safety and protective devices. Perform Mathematical calculations related to Electronics & Electrical. Use of right equipments, modes and ranges for measuring Electrical parameters. Identify the Electronic components. Read Data Sheets of Electrical and Electronic components. Application of Laws to analyse Electrical and Electronics circuits. Analyse and troubleshoot simple electrical circuits.	**3.5**

Professional and Technical Skills/ Expertise/ Professional Knowledge	Able to read the circuit diagrams, identify the Electrical and Electronic components and their values. Interpret & draw mechanical drawings using software applications. Interpret & Draw Electrical drawings using software applications. Use Mechanical and Electrical Hand tools. Operate conventional machine tools. Explain Three Phase AC Circuits and advantages of Three phase AC Circuits. Explain the working principle of DC motor, generator and Induction motor and implement the various starting methods. Explain the Characteristics of Op-amp and different circuits using Op-Amps. Name the types of wire joints.	Perform different types of Electrical wirings for different applications. Job Holder can use Electrical and Electronic Measuring Gadgets and Equipments. Use Electrical hand tools and measuring equipments, Components. Perform simple machining operations. Job Holder can Rig up Single Phase AC Circuit wiring for lights and other appliances. Soldering of thimbles to stranded wires and Crimping of Thimbles.	**3.5**
Employment Readiness & Entrepreneurship Skills & Mind-set/ Professional Skill	Describe good behaviour and work ethics. Explain constitutional values. Read, write, and comprehend English Language. Communicate and expressive.	Demonstrate responsible behaviour, good work culture, valued citizens of the country. Perform day to day activities effectively, report day to day happenings from time to time, and write official / personal communication to the superiors.	**3.5**

Broad Learning Outcomes/Core Skill	Specify the safety and best practices followed in the work area. Describe Electrical and Electronics components and equipments. List out the measuring tools, explain the operating procedure, Communicate with Peers and Superiors.	Will follow all safety norms and standard operating Procedures in the work area. Application of skills in the Electrical and Electronic assembly for manufacturing. Basic troubleshooting of simple Electrical and Electronics circuits and domestic wiring appliances.	**3.5**
Responsibility	Aware of Personal/Industrial goals. Adapt to changes in the work area. Able to assemble, install and repair electronic components and systems.	Work with caution and with due diligence to safety. Able to Carry out design, develop, test, produce and operate electrical and electronic equipment and systems. Can work with minimum supervision.	**3.5**

Annexure 2: Tools and Equipment (Lab Set-Up)

Tools and Equipment requirement for a batch of 30 Trainees

Sl. No.	Equipment	Specification	Quantity
1	Digital Oscilloscope	No of Channels - 2, Bandwidth: DC - 20 MHz	10
2	Dual - Power Supplies Regulated Power Supply, Adjustable	0-30V/1A	10
3	Dual - Fixed Power Supply	15-0-15 V/2A	10
4	Soldering Station – Temperature controllable	25W	3
5	IC Tester (for Linear IC's)		1
6	IC Tester (for Digital IC's)		1
7	Function Generator	Frequency Range: 0.3 Hz to 3 MHz, Functions: Sine, Square, Triangle, DC Sweep	10
8	LCR - Q Bridge		1
9	Three Phase Inductor motor	1hp/0.75kW	3
10	Three Phase Inductor motor	Star Delta Type/1hp	1
11	DC Motor and DC Generator Set, Including Speed Controller	1hp/220V	1
12	DC Source Variable	0-300V/10A	1
13	Single Phase Transformer	500VA/5A/230V/115V, with Terminal Point	3
14	Three Phase Transformer	440V/1kVA/15A with Terminal Box	1
15	Watt meter	(AC/DC) 1250W/300V/5A UPF	1
16	Watt meter	(AC/DC) 1250W/300V/5A LPF	1
17	Autotransformer	1 Phase, 0-270 V, 2A, with case and Main chord	1
18	Auto transformer	3 Phase/440V/1KVA	1
19	Relays	DC 5V/1A	3
		DC 12V/1A	3
		DC 24V/1A	3
		AC 5V/1A	3
		AC 12V/1A	3
		AC 24V/1A	3

20	Push button ON/OFF Switch	5A, with NO/NC elements	10
21	Fuse	HRC 16A with Holders	10
22	MCB	2 pole, 10A/9kA, C type	5
23	ELCB	2 pole, 16A/30mA	5
24	Energy Meter	Single Phase (kwh) 50 Hz	3
25	Decade Resistance box – 6 Dials	0.1 to 1 MΩ	3
26	Decade Capacitive box - 5 Dials	0.1 to 10 µf/63V	3
27	Decade inductive box - 5 Dials	0.1m to 10mH/1A	3
28	Rheostat	0-500Ω/10W	3
29	Screwdriver set		3
30	Needle Nose Pliers		3
31	Wire Cutters		1
32	Wire stripper		3
33	Portable Drilling machine		1
34	Safety Belt		1
35	Safety Shoes		15
36	Rubber Hand Gloves		15
37	Straight Cutter		2
38	Round File	200mm Second Cut	1
39	Measuring Tape	5m	3
40	Line Tester		5
41	Safety Helmet		3
42	Ring Spanner Set		1

43	Insulation Tape		10
44	Breadboard		15
45	Megger	Digit 0-2000 M Ohms 1000 V DC	1
46	Clamp meter	72-AUTO, 400A AC	1
47	Box Type Spanner		3
48	Adjustable Wrench		3
49	Mini Hacksaw	6 inches	3
50	PVC Pipe Cutter	1 inch	1
51	Crimping tool		3
52	Telescopic Gauge set	Total Range: 8-150mm	1
53	Small hole Gauge set	Measuring Range 3 to 5 mm, Gages Per Set 4	1
54	Electrical Work Bench	(L x B x H) 1200mm x 580mm x 840mm	3
55	Electrical Workstation	To be Fabricated	6

Electrical Circuit Analysis Lab Equipment

Sl. No.	Equipment	Specification	Quantity
1	Digital Oscilloscope	No of Channels - 2, Bandwidth: DC - 20 MHz	10
2	Dual - Power Supplies Regulated Power supply, Adjustable	0-30 V/1A	10
3	Dual - Fixed Power Supply	15-0-15 V/2A	10
4	Panel to measure the single-phase power by 3ammeter method		1
5	Panel to measure low and medium by V-A method		1
6	Panel to measure capacitance and power factor of capacitor		1
7	Panel to measure inductance and powerfactor of an induction coil		1
8	Panel to measure the single-phase power by 3voltmeter method		1
9	Decade Resistance box - 6 Dials	0.1 to 1 MΩ	2
10	Decade Capacitive box - 5 Dials	0.1 to 10 µf/63V	2

Applied Science Lab Equipment

Sl. No.	Equipment	Specification	Quantity
1	Force table	Force Table Circular with diameter 40cm with weights	2
2	Spring balance	5N & 10N	2 each
3	Slotted Weights	10 X 100gm	2
4	Simple pendulum Set	(Bob Pendulum) with stand	1
5	Balance stand	Wooden Wedge on Pillar	2
6	Stopwatch	Digital	1
7	Spring Constant Apparatus with weights		2
8	Retort Stand	With Boss Head and Clamp	2
9	Flow Cup Viscometerstand	Material SS, MS, Type Viscometer	2
10	Measuring Jar – 500ml	500ml	2
11	Measuring Jar – 1000ml	1000ml	2
12	Digital Balance		1

Mechanical Workshop : Machine Tools and Equipment

Sl. No.	Machine	Specification	Quantity
1	Workbench with Lockers – 2 Vices / Bench	1.5m X 0.8m X 0.7m	5
2	Bench Vice	125mm	10
3	Flat bastard file	300mm	10
4	Flat Second Cut File	250mm	10
5	Triangle second cut File	250mm	10
6	Square second cut file	250mm	10
7	Steel Rule	150mm	10
8	Steel Rule	300mm	10
9	Scriber	150mm	10
10	Center Punch	60° and 90°	10
11	Try Square	150mm	10
12	Hacksaw with Blade	300mm	10
13	Hammer	200g	10
14	Hammer	500g	3
15	Caste Iron Surface Plate	1000mm X 630mm with stand	1
16	Angle Plate	225mm X 150mm X 150mm	1

17	Vernier Height Gauge	450mm L.C 0.02	1
18	Vernier caliper	150mm, LC0.02	8
19	Micrometer (External)	0-25mm, Least count 0.01	3
20	Radius and Fillet Gauge	1mm to 7mm, 7.5mm to 15mm	3
21	Standard Wire Gauge	S.W.G – Round wire gauge	3
22	Feeler Gauge	0.025mm to 0.63mm	3
23	Screw Pitch Gauge	0.25mm to 6mm	3
24	Tap & Tap Wrench	M4-M12,200mm, M6-M20,375mm	3
25	Die & Die Holder	M4-M6, 200mm, M6-M8,200mm, M8-M12,315mm	2
26	Tool Storage Cabinets		1
27	Cutting Tools and Consumables		

Note:

- The Tools and Equipment and other lab facilities are shared between Qualifications and batches.
- During the admission the trainees are supplied with toolkit containing DMM, soldering rod, Breadboard, and other tools for conducting experiments in different labs.
- Trainees are provided with Laptop.
- Microcontroller Lab, IoT Lab will form a part of Digital Electronics Lab.
- Instrumentation and Measurement and Industrial Electronics will form a part of the Electronics lab.

Classroom Aids

The aids required to conduct sessions in the classroom are:

1. Black / white board
2. Projector with screen / Display TV
3. Laptop / computer

Annexure 3: Industry Validations Summary

Provide summary information of all the industry validations in table. This is not required for OEM qualifications.

Sl. No.	Organization Name	Representative Name	Designation	Contact Address	Contact Phone No.	E-mail ID	LinkedIn Profile *(if available)*
1	TATA STEEL	Ms. Charu Khullar		Bistupur, Jamshedpur-831001, Jharkhand	7763807838	charukhullar@tatasteel.com	
2	LOHIACORP	Mr. Umesh Kumar Trivedi		D-3/A, Panki Industrial Estate, Kanpur- 208022, India	7570009687	umesh.trivedi @lohiagroup.com	
3	MAKINO	Mr. Sudhakar S		No 11, Whitefield Main Rd, EPIPZone, Whitefield, Bengaluru, Karnataka 560066	8028412830	sudhakars@makino.co.in	
4	CONTROLPRINT	Mr. Rashtralpal		C-106, Hind Saurashtra Industrial Estate, Marol Naka, Andheri East, Mumbai 400059,	9892330112	rashtrapal@controlprint.com	
5	RAMKRISHNA FORGINGS LTD	Mr. Sunil Agarwall		Phase-VII, PlotNo M 15,16 NS 26 Industrial Area, Gamharia, Jamshedpur, Jharkhand 832109	9900987772	sunil.agrawall@ramkrishnaforgings.com	
6	FANUC	Mr. Ravinder		41-A, Electronics City, Hosur Road, Bengaluru	0900620356	ravinder.kumar@fanucindia.com	
7	ITC	Mr shivaprasad majlekar		No.18, Banaswadi Main Road, Maruthiseva Nagar, Bengaluru – 560005	8600211234	Shivaprasad. Majlekar@itc.i n	
8	SPICER	Mr. Krishna kumar		QR73+GC5, Sipcot Ph. I, Bangalore, Tamil Nadu 635126	7090621333	krishnakumar. rao@dana.co m	
9	VOLVO EICHER	Mr. Anirudh dongre		22/2, Yeshwant Niwas Rd, New Palasia, Indore, Madhya Pradesh 452003	9893286207	adongre@ve cv.in	
10	FOX SOLUTION	Mr. Vishal		M9, M I D C Area, Ambad, Nashik, Maharashtra 422010	9922935373	pralhad.dhumal@foxindia.net	
11	UNITED AIR EXPRESS	Mr. Ravindra K Singh		12, Diagonal Rd, South Park, Bistupur, Jamshedpur, Jharkhand 831001	7763807812	rkrsingh@tatasteel.com	
12	GABRIEL INDIA LIMITED	Ms. Richa		Gabriel India Ltd., 29, Milestone Village Kuruli, Pune Nasik Highway, Taluk Khed, Pune 410501, Maharashtra	9958076660	pooja.wadera @gabriel.co.in	

13	BIL ENERGY	Mr. Harsh Choudhry		B-11, Viral Shopping Center, Mantriwadi, Sainath Road, Malad West, Mumbai – 400064	9820430884	harsh@bilenergy.com	
14	ZF	Mr. Sudhir Patil		Industrial Area, Adityapur, Jamshedpur, Jharkhand 832108	9860026919	factory@zfindia.com	
15	Nuvoco Vistas Corp. Ltd.	Ms. Maya Tiwary		Jojobera, Jamshedpur, Jharkhand	9771415148	maya.tiwari@nuvoco.in	
16	GE	Mr. Ruddy		713206, Industrial Area, Durgapur, West Bengal 713201	8877810737	Ranganatha.GR@ge.com	
17	ACE MICROMATICS	Mr. Tarun J singh		Plot no 240, 3rd Stage, 241, 11th Main Rd, Yeshwanthpur Suburb II Stage, Peenya, Bengaluru, Karnataka 560058	8040200555	taruns@ace micromatic.com	
18	M.V.P ENTERPRISES	Mr. Subham Behera		House No. 16, Shop No. 7 Line, Bistupur Market, Jamshedpur, Jharkhand 831001	9110973145	mvpbatteries@gmail.com	
19	CAREFINE WOODWORKS	Mr. Avnish		Gat No. 906/8, Village, Shirur Taluka, Sanaswadi, Maharashtra 412208	9860093700	carefine@gmail.com	
20	LEONINE ENGINEERS PVT LTD	Mr. Kiran Gadre		6XJF+9HV, Manpada, Thane West, Thane, Maharashtra	9322227502	kirangadre@live.com	
21	NEW ERA INDUSTRIAL CORPORATION	Mr. Gandhi		Kamani Centre, 39-41-43, 2nd Floor, Bistupur Main Rd, Jamshedpur, Jharkhand 831001	9835178660	info@neicjsr.com	
22	EAPRO GLOBAL LTD	Mr. Anuj		Khasra No. 103, Salempur, Rajputana, Industrial Area, Roorkee, Uttarakhand 247667	9999771699		
23	CENTUM ELECTRONICS	Mr. Sujjendra		KHB Industrial Area, 44, 1st Main Rd, Yelahanka New Town, Bengaluru, Karnataka 560064	7259249307		
24	SSC PVT LTD	Mr. Venktesh		No. 201, 2nd Floor, Mota Chambers, Millers Road, Vasant Nagar, Bangalore 560052	9342578007	per.admi@sscpltd.com	
25	YAZAKI INDIA PVT LTD	Ms. Sunita J		Global Technology Park, Tower C, 2nd Floor Smartworks, Bellandur,	9940634361	j.sunita@layamweb.com	

				Bengaluru, Karnataka 560103			
26	PULSE MAGNETIC & POWER ELECTRONICS PVT LTD	Ms. Annupma		49, Udyog Vihar Phase 1, Dundahera Village, Sector 20, Gurugram, Haryana 122016	9971399553	anu@pmpe.in	
27	CYBER INFO SERVICES PVT LTD	Mr. Sanil Kumar		A-529, Pocket 40/203, Block A, Kalkaji, New Delhi – 110019	9811106938	cyberinfoservices@gmail.com	
28	RSB global	Mr.Pankaj		No.201/2/3/4,Pentagon 1,Second Floor, Magarpatta City, Pune - 411013	7260894810	pankaj.parida@rsbglobal.com	
29	ESSPROUT Technologies pvt ltd	Mr. Gouri Shankar		20, Vasanthapura Main Rd, Mango Garden Layout, Bengaluru, Karnataka 560078	9361515434	gowrishankar@esssprout.com	
30	Tesseract	Mr. Aman Modi		Sonari, Jamshedpur, Jharkhand	9930550709		
31	Chandan Steel Limited	Mr. Rohan Lapsiwala		C899+FG5, Nannur Chawk, S.S. Bari Road, Midnapore, West Bengal 721101	8000936260	hrd@chandansteel.net	
32	Schwing setter India pvt ltd	Mr. Jaypal		Unit Number 620/621, Corporate Centre, Lal Bahadur Shastri Marg, Mumbai, Maharashtra 400080	9884068927	jaypal.t@schwingstetterindia.com	
33	Aditya Birla	Mr. Pankaj Baranwal		Aditya Birla, Jawahar Nagar, Hatma, Ranchi, Jharkhand		pankaj.baranwal@adityabirla.com	

Annexure 4: Training & Employment Details

Training and Employment Projections: *Data to be provided year-wise for next 3 years*

Year	Total Candidates		Women		People with Disability	
	Estimated Training #	Estimated Employment Opportunities	Estimated Training #	Estimated Employment Opportunities	Estimated Training #	Estimated Employment Opportunities
2023	150	More than 2000	45	More than 200	-	
2024	250	More than 2000	75	More than 200	-	
2025	400	More than 2000	120	More than 200	-	

Training, Assessment, Certification, and Placement Data for previous versions of qualifications: (Previous years)

Qualification Version	Year	Total Candidates				Women				People with Disability			
		Trained	Assessed	Certified	Placed / Higher Studies	Trained	Assessed	Certified	Placed / Higher Studies	Trained	Assessed	Certified	Placed
Electrical and Electronics Engineering	2017- 2020	43	37	37	37	5	5	5	5				
	2018 - 2021	42	38	36	36	15	12	12	12				
	2019 - 2022	41	40	40	40	21	18	18	18				

Applicable for revised qualifications only, data to be provided year-wise for past 3 years.

List Schemes in which the previous version of Qualification was implemented:

1st year of 3 years Full Time diploma Programme

Content availability for previous **versions of qualifications:**

☐ Participant Handbook ☐ Facilitator Guide ☑ Digital Content ☐ Qualification Handbook ☑ Any Other: In NTTF LMS and Edusquares ERP

Languages in which Content is available: English.

Annexure 5: Blended Learning

Blended Learning Estimated Ratio & Recommended Tools:

Refer NCVET "Guidelines for Blended Learning for Vocational Education, Training & Skilling" available on:

https://ncvet.gov.in/sites/default/files/Guidelines%20for%20Blended%20Learning%20for%20Vocational%20Education,%20Training%20&%20Skilling.pdf

SL. No.	Select the Components of the Qualification	List Recommended Tools – for all Selected Components	Offline : Online Ratio
1	Theory/ Lectures - Imparting theoretical and conceptual knowledge	Physical classroom, LMS, Web based	90:10
2	Imparting Soft Skills, Life Skills, and Employability Skills /Mentorship to Learners	Physical classroom, Workshops, Mock sessions, Case study, Role play, Group Discussions, LMS	90:10
3	Showing Practical Demonstrations to the learners	Workshop / Lab, Video recording, Simulators	80:20
4	Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	Workshop machines, Lab equipment, Simulators, Mini projects, Project	80:20
5	Tutorials/ Assignments/ Drill/ Practice	Class assignments, LMS assignments, Simulators	60:40
6	Proctored Monitoring/ Assessment/ Evaluation/ Examinations	Physical classroom, Labs, Workshop, Quiz tests, Project	75:25
7	On the Job Training (OJT)/ Project Work Internship/ Apprenticeship Training	Industry	100:00

Annexure 6: Detailed Assessment Criteria

Detailed assessment criteria for each NOS/Module are as follows:

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Semester – 1					
Communication English -1	Parts of Speech-Form meaningful Sentences	22	-	-	-
	Verb Tenses-Use of right verb and tenses	10	-	-	7.5
	Language and Skill Development Exercises –Exercises on writing sentences	17.5	-	-	-
	Writing Skills-Writing letters & reports	6	-	-	-
	Sentences-Forming right sentences	7	-	-	10
	Language Skill Development-Oral communication skills	-	-	-	20
	Total Marks	100			
Applied Mathematics -1	Fundamentals of Mathematics-Solving arithmetical problems	20	-	-	-
	Matrices and Determinants-Solving Problems	20	-	-	-
	Complex Numbers -Understanding Complex Numbers	10	-	-	-
	Trigonometry-Application in Engineering	20	-	-	-
	Differential Calculus-Fundamentals	15	-	-	-
	Statistics-Application in Engineering	15	-	-	-
	Total Marks	100			
Applied Science	Physical World-Physical quantities and units	10	-	-	-
	Force, Motion and Energy –Definition and units	10	-	-	-
	Composition and Resolution of Forces-Resolving Forces	8	-	-	-
	Friction-Definition, Application in Engineering	8	-	-	-
	Equilibrium of Forces-Determining equilibrium of forces	8	-	-	-

	Centre of Gravity and Moment of Inertia-Determining for different objects	12	-	-	-
	Properties of Solids and Fluids- Properties of Solids and Fluids-	12	-	-	-
	Heat-Definition, Unit	12	-	-	-
	Industrial Chemistry-Introduction to pollution, Corrosion	12	-	-	-
	Renewable Energy-Introduction to wind and solar energy	8	-	-	-
	Total Marks	100			
Electronics	Introduction to Electronics-Atomic structure, Number and Charge	12.5	-	-	-
	Basic Components of Electronics-Resistor, Capacitor, Inductor, Switches	20	-	-	-
	Laws and Rules of Electronic Circuits-Ohms Law, Voltage divider rule	7.5	-	-	-
	Introduction to Semiconductors-Classification, N-P type	15	-	-	-
	PN Junction Diode and its applications-Diode types, construction, Function	17.5	-	-	-
	Special Purpose Diodes-Zener, LED, Photo, Tunnel	15	-	-	-
	PCB Assembly and Soldering-Methods, Types of PCB, Safety	12.5	-	-	-
	Total Marks	100			
Electrical Engineering	Fundamentals of Electric Circuit-Charge, Current, Energy, Power , Devices	7.5	-	-	-
	DC Sources-Types of cells, Battery, Safety	12.5	-	-	-
	Laws of Electricity-Ohms law, Kirchoff's law, Super position theorem	7.5	-	-	-
	AC Fundamentals-Comparison AC and DC , RMS value ,Peak factor	12.5	-	-	-
	Single Phase AC-Power factor, R-L-C circuits	12.5	-	-	-
	Three Phase AC-Single and Three phase comparison, Delta and Star connections	15	-	-	-
	Protective Devices-Fuse, Circuit breakers, Relays-types and function.	15	-	-	-
	Earthing- Need ,types, SI specification	12.5	-	-	-
	Types of Power Generation-Hydro, Thermal, Nuclear, Renewable.	5	-	-	-
	Total Marks	100			
Employability Skills	Introduction to Employability skills	20			5
	Behavior skills	20			5

	Constitutional Values and Citizenship	35			15
	Total Marks		100		
Applied Science Lab	Verification of Newton's third law of motion	-	10	-	5
	Parallelogram law: Find weight of a given body	-	10	-	-
	Triangle law of forces: Find the weight of a given body	-	10	-	5
	Verify Polygon law of forces using force table	-	10	-	-
	To measure torques on a rigid body	-	10	-	-
	Determination of acceleration due to gravity by using simple pendulum	-	5	-	-
	Determination of spring constant of the given helical spring	-	5	-	-
	Compare viscosity of two fluids using flow cup viscometer	-	10	-	5
	Experiments to understand surface tension		10	-	5
	Total Marks	-	100		
Electronics Lab	Electronics Lab Safety and Instructions	-	3	-	2
	Familiarization of Multi-meter and Power supply	-	4	-	2
	Familiarization of Function Generator and Cathode Ray Oscilloscope	-	4	-	2
	Familiarization of Tool kit items, Bread Board and its connections	-	4	-	-
	Electrical and Electronic components- Symbols and Identification	-	6	-	-
	Exercises based on Resistors-Find resistor value	-	6	-	-
	Exercises based on Capacitors-Find capacitor value	-	6	-	-
	Ohms Law	-	6	-	2
	Voltage Divider Rule and Current Divider Rule	-	4	-	2
	Exercises based on PN Junction Diode-Characteristic	-	4	-	2
	Exercises based on Light Emitting Diode-VI Characteristic	-	4	-	2
	Familiarization of Transformer-Types, function	-	3	-	2
	Half Wave rectifier, Center Tapped Full Wave rectifier, Bridge Full Wave rectifier	-	18	-	4
	Exercises based on Zener Diode- VI Characteristic	-	4	-	-
	Soldering Exercises on PCB	-	4	-	-
	Total Marks	-	100		
Electrical Engineering Lab	Electrical Lab Safety and Instructions, Rules and Regulations	-	4	-	2
	Familiarization of electrical components-Wires, Switches, Sockets & Plugs	-	6	-	2
	Parallel and Series wiring 3 loop/ 3 components	-	4	-	2
	One lamp by one switch, 2 Lamps by 1 switch	-	5	-	-
	Extension box	-	4	-	-
	Staircase wiring, Go down wiring	-	4	-	-

	Battery and Battery in Series and parallel connection	-	6	-	2
	Verify the Kirchhoff's current and voltage laws	-	6	-	2
	Verify the Super Position Theorem	-	4	-	2
	Loading effect on Power Supply	-	5	-	-
	Measurement of Electrical quantities in Resistive Load and Inductive Load	-	4	-	2
	Switching operation using Relay	-	5	-	-
	Testing instruments: 1: Clamp-on meter. 2: Megger, Checking Earthing	-	8	-	2
	Domestic House wiring	-	15	-	4
	Total Marks	-	100		
Engineering Drawing/ Fusion 360 Lab	Introduction to engineering drawing – Equipment, Lines.	-	8	-	6
	Engineering script- Lettering, Drawing Scale , Sheet sizes	-			
	Geometrical constructions-	-			
	Projections- Isometric, Orthographic, 1st and 3rd angle	-	5	-	5
	Dimensioning	-	4	-	4
	Sectional view	-			
	Engineering drawing exercises- Isometric to Orthographic, Draw Isometric	-	15	-	-
	Introduction to Fusion 360 – user interface	-	4	-	-
	Designing procedure (sketching and modelling)	-	14	-	5
	Fusion 360 drawing exercises	-	30	-	-
	Total Marks	-	100		
Workshop Practical -1	General safety rules for conduction of Workshop-while using hand tools and machines	-	4	-	2
	U – Channel exercise – Sawing, filing	-	14	-	2
	Steel Angle exercise– Sawing, filing	-	8	-	2
	Marking and Dot Punching	-	6	-	-

	Number and Letter Punching	-	6	-	-
	Chain drilling exercise- Drilling method	-	8	-	-
	Drill Plate exercise-Sizing, milling, drilling, counter bore etc.	-	14	-	4
	Pen stand Exercise	-	10	-	4
	Application based exercise	-	10	-	6
	Total Marks	-	100		
Basics of Computer Lab	Parts of computer- CPU, RAM ,ROM, Keyboard, Mouse	-	5	-	2.5
	Data representation using bit and byte- ASCII codes, KB,MB,TB	-	5.5	-	-
	Software- OS, GUI , install , uninstall	-	5	-	-
	Typing tutorial- QWARTY keyboards, typing speed	-	5	-	2
	PC tools-IP configuration, Task manager etc.	-	5	-	2.5
	Creating document (Word file)	-	17.5	-	3
	Email handling	-	5	-	2
	Power point presentation	-	12	-	3
	Excel	-	20	-	5
	Total Marks	-	100		
Semester - 2					
Communication English – 2	Internal correspondence-Memo, reports	6	-	-	4
	Technical Writing- Technical reports, procedure	6	-	-	4
	Organizational correspondence-Notice and agenda, Minutes of meeting	5	-	-	5.5
	Writing skill (activity based)	9.5	-	-	6
	Public Speaking-Shop talk, Lab talk	18	-	-	8
	Interview skills-Resume, Cover letter, Mock interview.	18	-	-	10
	Total Marks	100			
Applied Mathematics – 2	Percentage, Ratios and Proportions	7.5	-	-	-
	Analytical Geometry-Area, calculation methods	17.5	-	-	-
	Integral Calculus-Rules, functions	20	-	-	-
	Laplace Transform	12.5	-	-	-

	Statistics-Data, Average, Deviation, Range	15	-	-	-
	Correlation and Regression- Meaning, Analysis	15	-	-	-
	Sequence and series- formulas	12.5	-	-	-
	Total Marks	100			
Analog Electronics	Diode Applications-Rectifier, capacitors, Zener diodes,	24	-	-	-
	Transistor Basics and Biasing-PNP,NPN , Biasing, Application	18	-	-	-
	Small Signal BJT Amplifiers- Introduction, Bypass capacitors	18	-	-	-
	Differential Amplifiers- Construction and concepts	6	-	-	-
	Operational Amplifier (Op amp) Basics- Define, Block diagram, concept	23	-	-	-
	Field Effect Transistor- Junction field, MOSFET	5	-	-	-
	Opto Electronic Devices-Photo emissivity, conductivity, solar cell	6	-	-	-
	Total Marks	100			
Electrical Circuit Analysis	Basics of electricity-Power & energy, Sources, Conversion	10	-	-	-
	DC network- Node, Junction, Open & close circuit, Different theorem.	16	-	-	-
	Electrostatics- Electric charge, field, flux, Die-electric, Coulomb's law	10	-	-	-
	Magnetism-Faraday's & Lenz' law, Inductor	12	-	-	-
	AC fundamentals and circuits- Phase, RMS value, R_L_C circuits	16	-	-	-
	Poly phase circuits- Definition, advantage, STAR & DELTA	14	-	-	-
	Electrical machines- DC motor, generator, Working principles	16	-	-	-
	Industrial practices- Safety, Earthing.	6	-	-	-
	Total Marks	100			
Electrical Material Science	Magnetic materials- Permeability, Magnetization, types of magnets	25	-	-	-
	Conducting materials- Types, Properties,	25	-	-	-
	Insulating materials- Types , Properties	22.5	-	-	-
	Dielectric properties of materials-Die-electric parameters, constant, Materials	17.5	-	-	-
	Measurement and testing of materials- Die electric strength, flux density	10	-	-	-
	Total Marks	100			
Employability Skills	Effective learning skills	20	-	-	5
	English skills-Writing Skills	20	-	-	5
	Communication skills-Effective Oral & Written Communication	35	-	-	15
	Total Marks	100			

Analog Electronics Lab	Rectifier with capacitor filter- Half wave, Centre tap full wave, Bridge full wave	-	12	-	5
	Basic Gates :- AND & OR GATE, Peak Detector	-	6	-	-
	Clippers, Clampers, Voltage Doublers	-	12	-	5
	Transistor characteristics in CE configuration	-	6	-	-
	Common Emitter Amplifier- Dc and AC analysis	-	6	--	-
	Cascaded CE-CE amplifier	-	6	-	-
	Common Collector Amplifier, Emitter follower Voltage Regulator	-	6	-	-
	Darlington amplifier, square wave testing	-	6	-	-
	Transistor as switch, NPN Current mirror	-	10	-	5
	FET, MOSFET characteristics	-	10	-	5
	Total Marks	-	100		
Electrical Circuit Analysis Lab	Forming mesh and soldering exercises using 22 SWG tin coated copper wire	-	8	-	2
	Understanding the Loop and circuit Analysis	-	5	-	-
	Verification of Superposition theorem, Thevinin's theorem, Norton's theorem, maximum power transfer theorem	-	12	-	5
	Measure single phase power by a) 3 Voltmeter method b) 3 Ammeter method	-	12	-	3
	Measure the low and medium resistance by volt – ampere method	-	5	-	-
	Measure inductance and power factor of an inductive coil (RL circuit), Capacitive circuit (RC circuit)	-	6	-	2
	Measure inductance, capacitance, Resistance and power factor of a RLC series circuit, RLC parallel circuit	-	10	-	3
	Measurement of insulation resistance of a motor using Megger and Measure the value of earth resistance	-	6		-
	Measure power, power factor in a 1-phase circuit using wattmeter and verify results with calculation	-	6	-	-
	Study of AC Machines,DC Machines	-	10	-	5
	Total Marks	-	100		
Electrical CAD Lab	Introduction: Interface with Autocad and its tools	-	4	-	-
	Working with projects and drawings	-	8	-	2
	Draw the symbols of electrical circuits, measuring instruments	-	10	-	3

	Draw the connection of motor starter, electrical wiring diagram, HVAC panel board wiring, single line diagram	-	45	-	13
	Miscellaneous tools	-	4	-	-
	Projects	-	9	-	2
	Total Marks	-	100		
Workshop Practical - II	Introduction to machines - Lathe, Milling, Surface grinding i.e. Introduction to all operations in the machine. Operating methods	-	40	-	10
	Sheet metal exercise-Drilling , Threading , riveting in sheet metal	-	40	-	10
	Total Marks	-	100		
Electrical Wiring Lab	To make a series test lamp board and to use it for finding out simple electrical faults	-	6	-	-
	Series Connection, Parallel connection	-	10	-	3
	Stair case wiring, Go-down system wiring	-	10	-	-
	Hospital Wiring	-	5	-	-
	Make an extension board with two 5 A sockets and one 15 A socket controlled by their respective switches.	-	6	-	3
	Single phase circuits with cut outs, energy meter, main switch, fuses and distribution board with MCB, ELCB	-	6	-	3
	Rig up a fluorescent lamp with choke / starter	-	5	-	-
	Soldering of thimbles to stranded wires and Crimping of Thimbles	-	5	-	-
	Types of Wire Joints, Feeder Pipe Installation	-	10	-	3
	Components and sub-assemblies used in Panel Assembly Process - Connections and Applications	-	6	-	3
	Brief Application of PLC, Solenoids and Actuators	-	6	-	3
	Safety precautions	-	5	-	2
	Total Marks	-	100		
OJT	On the Job Training in the relevant sector	-	75	-	25
	Total Marks	100			

Annexure 7: Assessment Strategy

1. ASSESSMENT STRATEGY

The Criterion for assessment is based on Modules and will be assigned marks proportional to its importance.

The assessment for the semester-based qualification is carried out by conducting Formative and Summative Assessments.

Regarding Theory – Sessional is based on Intermediate Tests, File / Assignments & Viva –voce: Semester end examination wherein for each Individual batch, A&E dept. at corporate office, Bangalore creates unique question papers for theory part as well as practical – Theory comprises MCQ and descriptive questions drawn randomly from Question Bank.

Regarding the practical part, the experiments/ exercises are performed by the trainees during the LAB Hours and the trainees are allowed to record the learning of it which will be carried as their Record Marks & one Lab Test and semester end examination. Semester end examination is outcome-based experiments/ exercises of the course will be given to trainees to perform and based on the performance the mark will be awarded. The passing criteria is based on practical's performance, viva or oral exam, Test and final semester end examination.

Theory and practical Examinations are carried out by Examiners under the overall supervision of the Assessment and Evaluation Dept.

Evaluation of Theory and Practical examination is carried out by the Trained Assessors (NTTF faculty members) under the supervision of Shop floor Manager / senior faculty in a fair manner as per the assessment criteria set by A&E dept. of NTTF.

The Tabulation and processing of results shall be carried out under EDUSQUARE campus Software.

Assessment comprises the following components:

- Job carried out in Labs / workshops.
- Record book
- ONLINE Examination
- Answer sheet of assessment
- Viva-voce
- Semester end examination
- ON-THE-JOB training
- Tech Talk / Shop Talk
- Extracurricular and Co-curricular Activities
- Projects
- Attendance and punctuality

2. ASSESSORS

Evaluation of Theory and Practical examination is carried out by the Trained Assessors (NTTF faculty members) in a fair manner as per the assessment criteria set by A&E dept. of NTTF.
Assessors / Faculties are trained from time to time to upgrade their skills on various aspects such as conduct of assessments, teaching methodology etc.

3. ELIGIBILITY TO APPEAR FOR THE EXAM

- The candidates should have an attendance of a minimum 90% in a semester.
- The candidates should have secured minimum Sessional Marks in Theory & Practical

4. PASS CRITERIA

To pass the Qualification, every trainee should score a minimum of 40% in each Theory and 50% in each Practical and 60% in OJT / Projects.

5. RESULTS AND CERTIFICATION

The assessment results are backed by evidence collected by assessors. Successful trainees are awarded the Diploma certificate by NTTF Corporate Office.

6. ON THE JOB

1. The candidate must score 60% to successfully complete the OJT.
2. Tools of Assessment that will be used for assessing whether the candidate is having desired skills and etiquette of dealing with customer needs and requirements and perform Soft Skills effectively:
    - Videos/photos of Trainees during OJT
    - Suggestions / Kaizens from trainees
    - Rewards and appreciation to trainees as applicable
3. Assessment will ensure the following:
    - Effective engagement with the customers
    - Understand the working of various tools and equipment.

7. SYSTEM OF GRADING

An alphabetical letter grade will be assigned for each subject based on the total marks scored in the sessional and end semester examination.

Equivalent Grade Points are used: A = 9.5, B = 8.5, C = 7.5, D = 6.5, E = 5.5, F = 0 (FAIL), I = Incomplete (MP/AB/SP) Supplementary cleared = E

The student will be issued Semester Grade Report calculating SGPA / CGPA as follows:

$$\text{Semester Grade Point Average (SGPA)} = \frac{\Sigma \text{ (No. of Credits x Grade Point)}}{\Sigma \text{ (No. of Credits for the Program)}}$$

$$\text{Cumulative Grade Point Average (CGPA)} = \frac{\Sigma\ (\text{SGPA} \times \text{total Credits of each semester})}{\text{Total credits Acquired}}$$

Awarding of class:

a) Awarding of class for semester:

SGPA	Classification
8.5 and above	First class with distinction
7.5 to 8.4	First class
6.0 to 7.4	Second class
5.5 to 5.9	Pass class

b) Awarding of class for Programme:

First class with Distinction	Should have scored CGPA 8.5 and above and should have cleared all Semesters in the first attempt.
First class	Should have scored CGPA 7.5 to 8.4
Second class	Should have scored CGPA 6.0 to 7.4
Pass class	5.5 to 5.9

8. ASSESSMENT TOOLS

All assessment and evaluation activities are carried out under EDUSQUARE campus software which includes Formative assessment & Summative assessment.

- EDUSQUARE : NTTF ERP/CRM used for academic purpose EDUSQUARE erp.nttftrg.com used as SaaS (software as a service) mode
- Digital Valuation System: Digital Valuation system is an innovative software solution which automates manual evaluation and helps institutions to minimize the time, effort and human errors in the entire valuation process.
- Remote proctoring which includes AI based Auto Proctoring, Student authentication & Multi secure Exam browser as and when the need arises.

List of ICT Tools:

Desktop and laptops
Interactive While Board
CCTV Camera
Pen Drive
Video Conferencing
Biometric
Edusquare: NTTF ERP/CRM used for academic purpose Edusquare erp.nttftrg.com used as SaaS (Software as a Service) mode
Networking: Includes Wireless access Points, Switches, Routers, Controllers across all NTTF
AWS Cloud: AWS Cloud computing platform to host NTTF website www.nttftrg.com and used as backup storage.
Firewall: Network security device protecting our network by filtering traffic and blocking outsiders.
Microsoft (O365/M-365) – Email/office (Word, Excel, PPT, One Drive for all staff/students are provided using Microsoft O365 MDM (BYOD) policies implemented through M365 used as SaaS.

Annexure 8: Model Curriculum

Semester - 1	**Module Name: Communication English-1**	**Module Code: CP23101T**
Sl. No.	**Module Details**	**Theory Hours 60**
1	Parts of Speech	20h
2	Verb Tenses	8h
3	Language and Skill Development Exercises	15h
4	Writing Skills	4h
5	Sentences	4h
6	Language Skill Development	9h

Semester - 1	**Module Name: Applied Mathematics-1**	**Module Code: CP23102T**
Sl. No.	**Module Details**	**Theory Hours 60**
1	Fundamentals of Mathematics	6h
2	Matrices and Determinants	11h
3	Complex Numbers	9h
4	Trigonometry	14h
5	Differential Calculus	12h
6	Statistics	8h

Semester - 1	**Module Name: Applied Science**	**Module Code: CP23103T**
Sl. No.	**Module Details**	**Theory Hours 40**
1	Physical World	2h
2	Force, Motion and Energy	6h
3	Composition and Resolution of Forces	3h
4	Friction	3h

5	Equilibrium of Forces	5h
6	Centre of Gravity and Moment of Inertia	5h
7	Properties of Solids and Fluids	4h
8	Heat	4h
9	Industrial Chemistry	4h
10	Renewable Energy	4h

Semester - 1	**Module Name: Electronics**	**Module Code: CP23104T**
Sl. No.	**Module Details**	**Theory Hours 40**
1	Introduction to Electronics	5h
2	Basic Components of Electronics	8h
3	Laws and Rules of Electronic Circuits	3h
4	Introduction to Semiconductors	6h
5	PN Junction Diode and its applications	7h
6	Special Purpose Diodes	6h
7	PCB Assembly and Soldering	5h

Semester - 1	**Module Name: Electrical Engineering**	**Module Code: CP23105T**
Sl. No.	**Module Details**	**Theory Hours 40**
1	Fundamentals of Electric Circuit	3h
2	DC Sources	5h
3	Laws of Electricity	3h
4	AC Fundamentals	5h
5	Single Phase AC	5h
6	Three Phase AC	6h

7	Protective Devices	6h
8	Earthing	5h
9	Types of Power Generation	2h

Semester - 1	**Module Name: Applied Science Lab**	**Module Code: CP23106P**
Sl. No.	**Module Details**	**Practical Hours 30**
1	Vernier Calipers: Measure of volume of a solid cylinder	1.5h
2	Vernier Calipers: Measure of slant angle of a cone	1.5h
3	Vernier Calipers: Measure depth of a hallow cylinder	1.5h
4	Screw Gauge: Measure diameter of a thin wire. Find its SWG number	1.5h
5	Screw Gauge: Measure thickness of a metal sheet. Find its SWG number	1.5h
6	Measure diameter of a bore using a telescopic gauge	1.5h
7	Measure diameter of a small hole using small-hole gauge	1.5h
8	Determination of acceleration due to gravity by using Simple pendulum	1.5h
9	Verification of Newton's third law of motion	1.5h
10	Determination of spring constant of the given helical spring	1.5h
11	To measure torques on a rigid body	1.5h
12	Parallelogram law: Find weight of a given body	1.5h
13	Triangle law of forces: Find weight of a given body	1.5h
14	Verify polygon law of forces using force table	1.5h
15	Compare viscosity of two fluids using flow cup Viscometer	1.5h
16	Experiments to understand surface tension	1.5h
17	Experiment to show working of fibre optic cable	1.5h
18	Generate electricity using wind energy	1.5h
19	Generate electricity using solar energy	1.5h
20	PV Panel Characteristics	1.5h

Semester - 1	**Module Name: Electronics Lab**	**Module Code: CP23107P**
Sl. No.	**Module Details**	**Practical Hours 60**
1	Electronics Lab Safety and Instructions	2h
2	Familiarization of Multi-meter	2h
3	Familiarization of Power Supply	2h
4	Familiarization of Function Generator and Cathode Ray Oscilloscope	4h
5	Familiarization of Tool kit items, Bread Board and its connections	2h
6	Symbols of Electrical and Electronic components	1h
7	Identification of Electronic Components and Equipment's	1h
8	Exercises based on Resistors	4h
9	Exercises based on Capacitors	4h
10	Ohms Law	4h
11	Voltage Divider Rule and Current Divider Rule	4h
12	Exercises based on PN Junction Diode	4h
13	Exercises based on Light Emitting Diode	4h
14	Familiarization of Transformer	2h
15	Exercises based on Half Wave rectifier	4h
16	Exercises based on Center Tapped Full Wave rectifier	4h
17	Exercises based on Bridge Full Wave rectifier	4h
18	Exercises based on Zener Diode	4h
19	Soldering Exercises on PCB	4h

Semester - 1	Module Name: Electrical Engineering Lab	Module Code: CP23108P
Sl. No.	**Module Details**	**Practical Hours 60**
1	Electrical Lab Safety and Instructions	2h
2	Explanation of Indian Electrical Rules	1h
3	Safety labels for Electrical equipment and facilities management	1h
4	Familiarization of electrical components	4h
5	Parallel and Series wiring 3 loop/ 3 components	4h
6	One lamp by one switch	2h
7	2 Lamps by 1 switch	2h
8	Extension box	4h
9	Staircase wiring	2h
10	Go down wiring	2h
11	Familiarize the Battery and Battery in Series and parallel connection to make a battery bank	4h
12	To verify the Kirchhoff's current and voltage laws	4h
13	To verify the Super Position Theorem	4h
14	Loading effect on Power Supply	4h
15	Measurement of Electrical quantities in Resistive Load and Inductive Load	4h
16	Switching operation using Relay	4h
17	Familiarization of testing instruments: 1: Clamp-on meter. 2: Megger	2h
18	Checking whether Earthing is Proper by bulb method and DMM method	2h
19	Domestic House wiring	8h

Semester - 1	Module Name: Engineering Drawing / Fusion 360 Lab	Module Code: CP23109P
Sl. No.	**Module Details**	**Practical Hours 60**
1	Introduction to engineering drawing	2h

2	Engineering script	2h
3	Geometrical constructions	1h
4	Projections	4h
5	Dimensioning	1h
6	Sectional view	2h
7	Engineering drawing exercises	10h
8	Introduction to Fusion 360	3h
9	Designing procedure (sketching and modelling)	10h
10	Fusion 360 drawing exercises	25h

Semester - 1	**Module Name: Workshop Practical 1**	**Module Code: CP23110P**
Sl. No.	**Module Details**	**Practical Hours 80**
1	General safety rules for conduction of Workshop	4h
2	U – Channel	15h
3	Steel Angle	9h
4	Marking and Dot Punching	5h
5	Number and Letter Punching	5h
6	Chain drilling exercise	9h
7	Drill Plate	17h
8	Pen stand	8h
9	Application based exercise	8h

Semester - 1	**Module Name: Basics of Computer Lab**	**Module Code: CP23111P**
Sl. No.	**Module Details**	**Practical Hours 40**
1	Parts of computer	3h

2	Data representation using bit and byte	3h
3	Software	2h
4	Typing tutorial	2h
5	PC tools	2h
6	Creating document (Word file)	9h
7	Email handling	3h
8	Power point presentation	6h
9	Excel	10h

Semester - 1	**Module Name: Employability Skills**	**Module Code: CP23112T**
Sl. No.	**Module Details**	**Theory Hours 30**
1	Introduction to Employability skills	10h
2	Behavior skills	10h
3	Constitutional Values and Citizenship	10h

Semester - 2	**Module Name: Communication English - II**	**Module Code: CP23201T**
Sl. No.	**Module Details**	**Theory Hours 40**
1	Internal correspondence	4h
2	Technical Writing	4h
3	Organizational correspondence	3h
4	Writing skill (activity based)	8h
5	Public Speaking	9h
6	Interview skills	12h

Semester - 2	Module Name: Applied Mathematics - II	Module Code: CP23202T
Sl. No.	**Module Details**	**Theory Hours 40**
1	Percentage, Ratios and Proportions	3h
2	Analytical Geometry	7h
3	Integral Calculus	8h
4	Laplace Transform	5h
5	Statistics	6h
6	Correlation and Regression	6h
7	Sequence and series	5h

Semester - 2	Module Name: Analog Electronics	Module Code: CP23203T
Sl. No.	**Module Details**	**Theory Hours 60**
1	Diode Applications	16h
2	Transistor Basics and Biasing	12h
3	Small Signal BJT Amplifiers	12h
4	Differential Amplifiers	4h
5	Operational Amplifier (Op amp) Basics	9h
6	Field Effect Transistor	3h
7	Opto Electronic Devices	4h

Semester - 2	Module Name: Electrical Circuit Analysis	Module Code: CP23204T
Sl. No.	**Module Details**	**Theory Hours 60**
1	Basics of electricity	6h

2	DC network	10h
3	Electrostatics	6h
4	Magnetism	8h
5	AC fundamentals and circuits	10h
6	Poly phase circuits	8h
7	Electrical machines	9h
8	Industrial practices	3h

Semester - 2	**Module Name: Electrical Material Science**	**Module Code: CP23205T**
Sl. No.	**Module Details**	**Theory Hours 40**
1	Magnetic materials	10h
2	Conducting materials	10h
3	Insulating materials	9h
4	Dielectric properties of materials	7h
5	Measurement and testing of materials	4h

Semester - 2	**Module Name: Analog Electronics Lab**	**Module Code: CP23206P**
Sl. No.	**Module Details**	**Practical Hours 60**
1	Half wave rectifier with capacitor filter	3h
2	Centre tap full wave rectifier with capacitor filter	3h
3	Bridge full wave rectifier with capacitor filter	3h
4	Basic Gates :- AND & OR GATE, Peak Detector	3h
5	Clippers	3h
6	Clampers	3h
7	Voltage Doublers	3h

8	Revision	3h
9	Transistor characteristics in CE configuration	3h
10	Common Emitter Amplifier- Dc and AC analysis	3h
11	Cascaded CE-CE amplifier	3h
12	Common Collector Amplifier, Emitter follower Voltage Regulator	3h
13	Revision	3h
14	Darlington amplifier, square wave testing	3h
15	Transistor as switch	3h
16	NPN Current mirror	3h
17	Revision	3h
18	FET characteristics	3h
19	MOSFET characteristics	3h
20	Revision	3h

Semester - 2	**Module Name: Electrical Circuit Analysis Lab**	**Module Code: CP23207P**
Sl. No.	**Module Details**	**Practical Hours 60**
1	Forming mesh and soldering exercises using 22 SWG tin coated copper wire	4h
2	Understanding the Loop and circuit Analysis	3h
3	Verification of Superposition theorem	3h
4	Verification of Thevinin's theorem	3h
5	Verification of Norton's theorem	3h
6	Verification of maximum power transfer theorem	3h
	Revision	3h
7	Measure single phase power by a) 3 Voltmeter method	3h
8	Measure single phase power by a) 3 Ammeter method	3h

9	Measure the low and medium resistance by volt – ampere method	3h
10	Measure inductance and power factor of an inductive coil (RL circuit)	3h
11	Measure inductance and power factor of an Capacitive circuit (RC circuit)	3h
12	Measure inductance, capacitance, Resistance and power factor of a RLC series circuit	3h
13	Measure inductance, capacitance, Resistance and power factor of a RLC parallel circuit	3h
	Revision	3h
14	Measurement of insulation resistance of a given motor using Megger and Measure the value of earth resistance	3h
15	Measure power, power factor in a 1-phase circuit using wattmeter and verify results with calculation	3h
16	Study of AC Machines	3h
17	Study of DC Machines	3h
	Revision	2h

Semester - 2	**Module Name: Electrical CAD Lab**	**Module Code: CP23208P**
Sl. No.	**Module Details**	**Practical Hours 40**
1	Introduction: Interface with Autocad and its tools	2h
2	Working with projects and drawings	4h
3	Draw the symbols used in electrical circuits	6h
4	Draw the symbols for measuring instruments	4h
5	Draw the connection of motor starter	4h
6	Draw the electrical wiring diagram	6h
7	Draw the HVAC panel board wiring	4h
8	Draw the single line diagram	5h
9	Miscellaneous tools	2h
10	Projects	3h

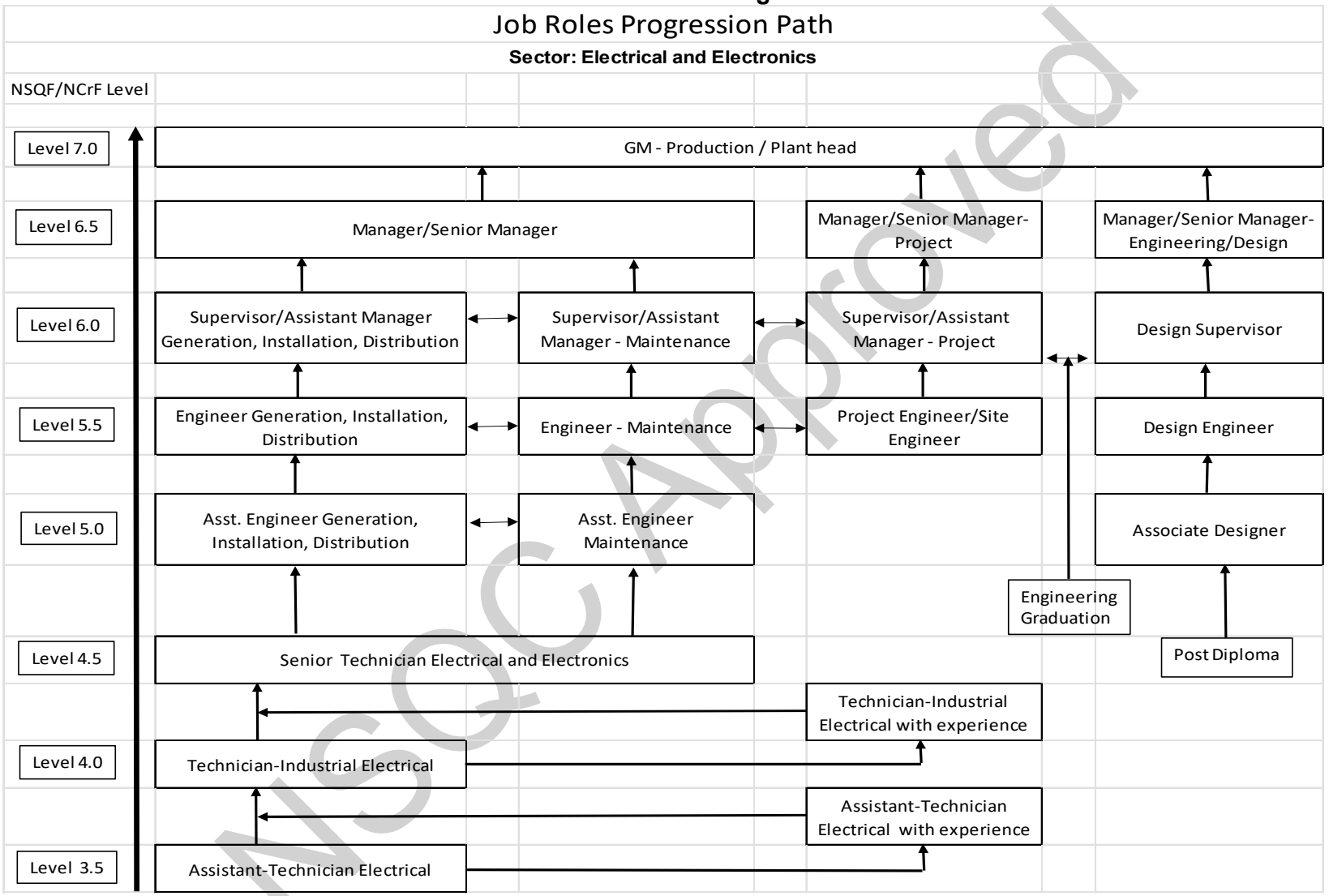
Semester - 2	**Module Name: Workshop Practical 2**	**Module Code: CP23209P**
Sl. No.	**Module Details**	**Practical Hours 30**
1	Introduction to machines - Lathe, Milling, Surface grinding (i.e. Introduction to all operations in the machine.)	15h
2	Sheet metal exercise	15h

Semester - 2	Module Name: Electrical Wiring Lab	Module Code: CP23210P
Sl. No.	**Module Details**	**Practical Hours 50**
1	To make a series test lamp board and to use it for finding out simple electrical faults	2h
2	Series Connection (Two or more lamps connected in series and controlled by means of one switch)	3h
3	Parallel connection - (Two or more lamps connected in Parallel and controlled independently with two SPST switches)	3h
4	Stair case wiring - One lamp controlled from two and more different points	3h
5	Go-down system wiring	2h
6	Hospital Wiring	2h
7	To make an extension board with two 5 A sockets and one 15 A socket controlled by their respective switches. Also, to provide a fuse and an indicator	5h
8	Single phase circuits with cut outs, energy meter, main switch, fuses and distribution board with MCB, ELCB	5h
9	Rig up a fluorescent lamp with choke / starter	2h
10	Soldering of thimbles to stranded wires and Crimping of Thimbles	3h
11	Types of Wire Joints	5h
12	Feeder Pipe Installation	3h
13	Components and sub-assemblies used in Panel Assembly Process - Connections and Applications	5h
14	Brief Application of PLC, Solenoids and Actuators	5h
15	Safety precautions	2h

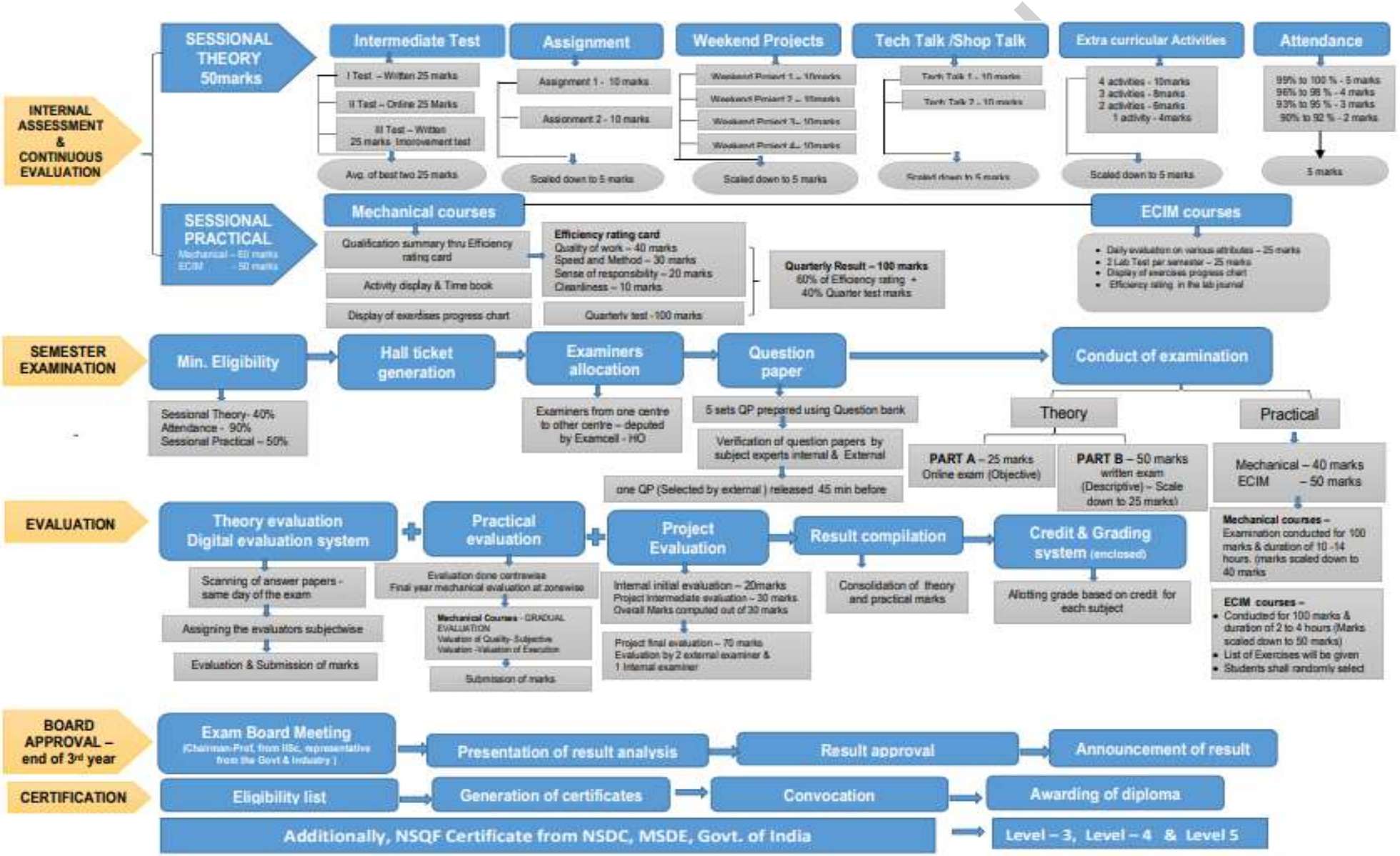
Semester - 2	Module Name: Employability Skills	Module Code: CP23211T
Sl. No.	**Module Details**	**Theory Hours 30**
1	Effective learning skills	10h
2	English skills-Writing Skills	10h
3	Communication skills-Effective Oral & Written Communication	10h

Semester – 2	Module Name: OJT	Module Code: CP23212P
Sl. No.	**Module Details**	**Practical Hours 90**
1	On the Job Training in the relevant sector	90h
	Total Hours	**90h**

Annexure 9: Career Progression



Annexure 10: Assessment SOP



Annexure 11: Occupational Map

Sector Name: Electrical and Electronics

As per NCrF		As per NCO-2015	Sub-Sector 1/Electrical generation, Transmission, Power system, Power equipment, Renewable energy		
NCrF Level (1-8)	**Level Descriptors**	**NCO-15 -- Family (First 4 digits code/s for the given level crosscutting the OM Sub-Sectors/ Occupations)**	**Occupation 1/ Power Generation, Installation, distribution**	**Occupation 2/ Maintenance**	**Occupation 3/ Design-Electrical Engineering**
Level 8.0	**1.** Professional Theoretical Knowledge: **Mastery of knowledge / Innovation driven/ Comprehensive knowledge** **2.** Professional and Technical Skills/ Expertise: **Most advanced Technical and Managerial skills** **3.** Employment Readiness & Entrepreneurship Skills & Mind-set: **Significant authority, transformational leadership, Social intelligence** **4.** Broad Learning Outcomes: **Lead large transformational projects** **5.** Responsibility: **Business Vision Chairperson/ Board Member / CMD**	1120	Managing Director	Managing Director	Managing Director
Level 7.0	**1.** Professional Theoretical Knowledge: **Advanced knowledge with critical understanding of emerging developments** **2.** Professional and Technical Skills/ Expertise: **Highly specialized skills, transdisciplinary skills, leadership skills** **3.** Employment Readiness & Entrepreneurship Skills & Mind-set: **Cross cultural competency, transformational leadership** **4.** Broad Learning Outcomes: **Apply acquired advanced technical skills, technical appraisal and reviews**	1321 2151 2152	GM - Production/Plant Head	GM - Production/Plant Head	GM - Production/Plant Head

	5. Responsibility: **Business Management (like GM/ CEO / CXO, etc.)**				
Level 6.5	**1.** Professional Theoretical Knowledge: A**dvanced multidisciplinary and specialized knowledge** **2.** Professional and Technical Skills/ Expertise: A**dvanced Technical and Managerial Skills** **3.** Employment Readiness & Entrepreneurship Skills & Mind-set: **Leadership, effective resource management** **4.** Broad Learning Outcomes: **Judgement in complex problems** **5.** Responsibility: **Vertical/ Business unit management – Manager or Senior Manager**	3115 1321	Manager/Senior Manager Electives - overall in charge of Installation, Assembly of electrical /electronic systems of equipment and machinery, Power Systems, Training Options - Power generation, Distribution, Transmission, Renewable energy.	Manager/Senior Manager Electives - responsible for maintaining status of continuous running of equipment and machinery control and monitoring devices Options - Power generation, Distribution, Transmission, Renewable energy.	Manager/Senior Manager Electives - Verify Design of Electrical generation/distribution equipment, plant, R&D of new products, Estimation Options - Power generation, Distribution, Transmission, Renewable energy.
Level 6.0	**1.** Professional Theoretical Knowledge: **Multidisciplinary and specialized knowledge** **2.** Professional and Technical Skills/ Expertise: **Range of skills along with specialized domain skills** **3.** Employment Readiness & Entrepreneurship Skills & Mind-set: **Entrepreneurial mindset, selfmanagement** **4.** Broad Learning Outcomes: **Judgement / decision making – specialized** **5.** Responsibility: **Team leader – Junior technical supervisor, Technical supervisor or junior/ deputy manager**	3122 3123 3115	Supervisor/Assistant manager Electives -Supervise Installation, Assembly of electrical /electronic systems of equipment and machinery, Power Systems, Verify Estimation & costing, Training Options - Power generation, Distribution, Transmission, Renewable energy.	Supervisor/Assistant manager Electives - Responsible for Maintenance of electrical /electronic systems of equipment and machinery Options - Power generation, Distribution, Transmission, Renewable energy.	Design Engineer Electives - Verify Design of Electrical generation/distribution equipment, plant, R&D of new product, Estimation Options - Power generation, Distribution, Transmission, Renewable energy.

Level 5.5	**1.** Professional Theoretical Knowledge: **Specialized knowledge** **2.** Professional and Technical Skills/ Expertise: **Specialized skills** **3**. Employment Readiness & Entrepreneurship Skills & Mind-set: **Team readiness, self-entrepreneurship readiness** **4.** Broad Learning Outcomes: **Specialized/ complex jobs/tasks** **5**. Responsibility: **Self and team responsibility – Sr. Technician or Master Technician/Engineer**	2151 2152	Engineer-Project/Site Electives -Plan and execute Installation, Assembly of electrical /electronic systems of equipment and machinery, Power Systems, Estimation & costing Options - Power generation, Distribution, Transmission, Renewable energy.	Engineer Electives - Plan, execute periodic Maintenance of electrical /electronic systems of equipment and machinery Options - Power generation, Distribution, Transmission, Renewable energy.	Design Engineer Electives - Design of Electrical generation/distribution equipment, plant, R&D of new products Options - Power generation, Distribution, Transmission, Renewable energy.
Level 5.0		2151 2152 3113 8212	Assistant Engineer Electives - Installation, Assembly of electrical /electronic systems of equipment and machinery, Power Systems, Testing, Estimation and Costing Options - Power generation, Distribution, Transmission, Renewable energy.	Assistant Engineer Electives - Installation, Maintenance of electrical /electronic systems of equipment and machinery Options - Power generation, Distribution, Transmission, Renewable energy.	Associate Designer Electives - Design of Electrical generation/distribution equipment, plant, R&D of new products Options - Power generation, Distribution, Transmission, Renewable energy.
Level 4.5	**1.** Professional Theoretical Knowledge: **Range of knowledge** **2.** Professional and Technical Skills/ Expertise: **Range of technical skills** **3.** Employment Readiness & Entrepreneurship Skills & Mind-set: **Team readiness & Enterpreurial readiness** **4.** Broad Learning Outcomes: **Carry out Range of tasks and may provide range of solutions** **5**. Responsibility: **Accountable/ responsible - Senior Technician Electrical and Electronics**	3113 7411 3114	Senior Technician Electrical and Electronics Installation, Assembly of electrical /electronic systems of equipment and machinery. Power Systems, Testing. Options - Power generation, Distribution,	Senior Technician Electrical and Electronics Electives - Installation, Maintenance of electrical /electronic systems of equipment and machinery. Options - Power generation, Distribution,	Study Post Diploma

			Transmission, Renewable energy.	Transmission, Renewable energy.	
Level 4.0	**1.** Professional Theoretical Knowledge: **Range of knowledge** **2.** Professional and Technical Skills/ Expertise: **Range of technical skills** **3.** Employment Readiness & Entrepreneurship Skills & Mind-set: **Team member, follow instructions** **4.** Broad Learning Outcomes: **Carry out Range of tasks with minimum supervision.** **5**. Responsibility: **Accountable/ responsible - Technician**	3113 7411	Technician-Industrial Electrical. Cable laying	Technician-Industrial Electrical. Cable laying and maintenance	
Level 3.5	**1.** Professional Theoretical Knowledge: **Range of knowledge** **2.** Professional and Technical Skills/ Expertise: **Range of technical skills** **3.** Employment Readiness & Entrepreneurship Skills & Mind-set: **Team member, follow instructions** **4.** Broad Learning Outcomes: **Carry out Range of tasks with minimum supervision.** **5**. Responsibility: **Accountable/ responsible - Jr.Technician/ Technician**	3113 8212	Assistant Technician Electrical Generator operator Wiring	Assistant Technician Electrical, Maintenance of electrical equipment. Generator maintenance.	

Annexure 12: Key Learning Outcome

SL. NO.	SUBJECT NAME	KNOWLEDGE AND UNDERSTANDING	TECHNICAL & PROFESSIONAL SKILLS	APPLICATION OF KNOWLEDGE AND SKILLS
		FIRST YEAR		
1	**Communication English -1 (CP23101T)** **Communication English -2 (CP23201T)** Ability to communicate effectively	Understand, comprehend grammar. Formation of simple sentences.	Communicate with peers. Writing skills - Internal & Organizational correspondence, technical writing. Public Speaking.	Write Business Letters Reports as necessary in Profession. Interact, communicate during Interviews, debates, and Group Discussion for Career Development. Develop Presentation Skills.
2	**Applied Mathematics -1 (CP23102T)** **Applied Mathematics -2 (CP23202T)** Ability to solve various mathematical problems	Basic Algebra. Linear and quadratic equations. Understanding Analytical geometry, Correlation and regressions, sequences, and series. Laplace Transform	Use of Trigonometry, Matrices and determinants, differential, and Integral calculus for solving Technical and Engineering problems.	Apply Statistics in Interpreting Data. Graphical representation of Data. Use appropriate units and measurements during interactions and discussions in the work area. Determine Percentage, Proportions and Ratios in day-to-day life.
3	**Applied Science (CP23103T)** **Applied Science Lab - (CP23106P)** Understanding various physical quantities, Conservation, and transfer of different forms of energy.	Interpret Different systems of Units and convert from one unit to another. Industrial Chemistry.	Describe Physical Law governing Translatory and Rotational Motions. Evaluating Work, Power, and Energy.	Application of Physical laws, Fluid Dynamics, concepts of Heat, and measurement, in the work area. Various energy sources, conversion, and conservation of energy. Renewable energy sources.

4	**Electronics (CP23104T)** **Electronics Lab (CP23107P)** Understanding different electronic components and their characteristics	Understand Types, Parameter, Characteristics, Configuration of Diodes Introduction to wave shaping circuits- Clipper, clamper, Peak detector etc. Identify Passive and Active Components their Symbols, Specification and explain their Characteristics and Applications	Handle Multimeter, Power supply, Function Generator and CRO Design Different Types of Rectifier Circuits Zener diode applications- voltage regulation	Application of laws governing electronic circuits (Ohm's law), solving problems, voltage and current divider circuits application Soldering and de-soldering techniques, Safety procedure to be followed and best practices
5	**Electrical Engineering (CP23105T)** **Electrical Engineering Lab (CP23108P)** Ability to analyse different AC and DC Circuits, understanding functioning and controlling Electrical Machines.	Distinguish between Charge and Current, Potential Difference and EMF, Electric and Electronics Devices. Understanding on Power and Energy, Classification of Power resources, Knowledge on DC sources and their types. Understanding on various DC and AC parameters. Reduction of single-phase AC circuits. (Power factor, active reactive, Apparent Power, R-L-C Circuits) Power Generation and Distribution. Explain Three Phase AC Circuits, comparison, and advantages of Three phase AC Circuits, Phase difference, Delta and Star Configurations and applications	State Specification and Applications of Electrical hand tools and identify Electrical safety symbols. Reduce circuits using different laws and theorems of electricity. Distinguish between single phase and 3 phase connections and their applications. Specification and Applications of Fuses, various Circuit breakers and Relays.	Will be Aware of Electrical fault conditions and Safety Procedures of Electrical Devices Use appropriate protective devices (fuse and their types, circuit breakers and their types, Relay and their types) Use Electrical hand tools and measuring equipment, Components, Safety and protection devices for development of Electrical circuits. Earthing and conditions. Rig up Single-Phase AC Circuit wiring for lights and other appliances.

6	**Computer LAB (CP23111P)** Creation of various reports and documentations using MS Office.	Identify the components of a computer system and demonstrate basic proficiency in commonly used applications.	Prepare presentation and report on computer system. Create, design, and produce professional documents using word processing software (i.e., MS Word). Process, manipulate, and represent numeric data using the basic functions of spreadsheet software (i.e., MS Excel). Installation of OS, Personalisation of PC, and other maintenance tools.	Demonstrate and apply strategies for merging and integrating source data from multiple applications.
7	**Workshop -1 (CP23110P)** **Workshop -2 (CP23209P)** Understanding the safety and ability to operate the conventional machines.	Describe and explain the classification, selection and use of hand tools.	Describe the construction, classification and function of job holding devices Describe the construction and functioning of cutting Tools and use them in the machining process conventional.	Follow all safety precautions prescribed for workshop operations Read and interpret the Workshop drawings. Perform different operations on the assigned job to achieve defined Specifications and dimensions.
8	**Engineering Drawing/** **Fusion 360 (CP23109P)** Ability to create Engineering Drawing through CAD software Application.	Describe the difference between first and third angle projection method. Differentiate orthographic and isometric projection. Explain the different types of sectioning and draw sectional views	Explain the different methods of geometric construction. Explain the types, uses and application of scale, lines, drawing sheet, layout, title block. Describe the Designing Procedure (Sketching & Modelling) Create and plot assembly and detail views of geometrical in 3D Modelling	Dimensioning Draw Orthographic projection, Isometric drawing, different types of sectioning and draw sectional views Will have the ability to draw the Two-dimensional (2D) and three dimensional (3D) diagrams as per given dimensions using Fusion 360. Create and plot assembly and detail

				views of geometrical in 3D Modelling. Perform CAD application in 2D modelling
9	**Analog Electronics (CP23203T)** **Analog Electronics Lab (CP23206P)** Understanding different electronic components and their characteristics and analysis of simple circuits.	Understand Types, Parameter, Characteristics, Configuration of BJT, FET and MOSFET Knowledge on wave shaping circuits- Clipper, clamper, Peak detector etc. Distinguish between BJT and JFET Understand small signal amplifier their characteristics and frequency response. To understand the Working, Connection, and applications of Opto-electronics Devices Explain the Characteristics of Op-amp, symbol and applications- Differential amplifier, current mirrors	Construction, working and applications of Differential amplifier (inverting & non-inverting), NPN & PNP current mirror. Design the different amplifiers. Perform ac and dc analysis of electronic circuits Design and troubleshooting of electronic circuits	Use of ESD Identify the components & read and comprehend the datasheet. Design and troubleshooting of electronic circuits Follow safety practices in the Lab
10	**Electrical Circuit Analysis (CP23204T)** **Electrical Circuit Analysis LAB (CP23207P)** Ability to analyse AC and DC circuits using different theorems, understanding the parameters associated with	Distinguish between Power and Energy. Classification of various Power sources (current & voltage source and its conversion), Reduction of Network using Star-Delta and Delta-Star transformation concepts. Reduction of single phase AC	Analyse circuits governing the laws of magnetism and inductance (series and parallel combinations). Analyse and explain different components of single-phase ac circuits (phase difference, lead, lag etc.)	Follow the safety precautions. while working on electric installations Rig up Single-Phase AC Circuit wiring for lights and other appliances. Starting, Controlling and testing of AC and DC Machines.

	the circuit components.	circuits. (Power factor, active reactive, Apparent Power, R-L-C Circuits) Describe various ac parameters (RMS, Average, peak, Form factor) Explain the working principle of DC motor, generator and Induction motor and implement the various starting methods. Explain the concepts of Electrostatics, capacitor and properties and measure of capacitance. Explain the need and advantage of poly phase circuits, load balancing, star/delta connections and relationships (line and phase).	Specification and Applications of AC and DC Machines. Reduce /analyse circuits using different laws and theorems of electricity.	
11	**Electrical Material Science (CP23205T)** Understanding the properties of Materials used Electrical applications	Explain the parameters and properties of magnetic materials. Understanding different ferro Magnetic materials, their behaviour with change in temperature. Knowledge on Magnetic data storage materials. Understand and explain the properties and applications of conducting materials and Alloys, semi conducting materials, their applications and insulating materials, Di-electric materials.	Materials used in different electronic transducers. Insulating materials used in various electronic components, AC/ DC Machines, Properties of material used in photo conductivity, photo Electric emission, photo voltaic cells, photo conductive cells, photo emissive cells and nano technology.	Materials used in various AC Machines. Measurement of dielectric strength of solids, liquids, and gases, di-electric parameters of Insulators.

12	**Electrical CAD LAB (CP23208P)** Ability to create Electrical drawings through Auto CAD software.	Understand the different tools in Auto CAD Understand the symbols and measuring instruments and draw the circuits using various commands	Draw the Electrical wiring using software	Select the right component and draw the electrical circuits using Auto CAD – House wiring, Distribution Board and HVAC Panel Board Wiring
13	**Electrical Wiring Lab (CP23210P)** Ability to draw and simulate electronic circuits using LT Spice software.	Understand series and parallel connections. Understand the different wiring methods- staircase, go down and hospital wiring Explain the types of wire joints Explain the applications of PLC, Solenoids and Actuators	Able to make different electrical wirings. Rig up a fluorescent lamp with choke / starter Able to develop Single phase circuits with cut outs, energy meter, main switch, fuses and distribution board with MCB, ELCB	Follow all prescribed safety practices in the lab Select the components as per the application and rig up the Circuit Soldering of thimbles to stranded wires and Crimping of Thimbles
14	**Employability Skills (CP23112T)** **Employability Skills (CP23211T)** Ability to behave appropriately. Understand Constitutional Values/ role of citizen. Ability to communicate appropriately. Understand Diversity and Inclusion.	Knowledge and understanding of all Human relation Principles. Knowledge and understanding of the constitution of Indian state and the preamble of the constitution. Fundamental Duties of the citizen of India. Knowledge and understanding of types of communication. Good understanding about Diversity and Inclusion in the workplace.	Able to practice HRP with peer groups to maintain healthy relationships. Practice the constitutional values in society. Being ethical and moral in society following all the fundamental duties in the society. Practice effective communication with peers, superiors and subordinates with empathy and care. Practice a sense of belonging in the society leaving behind all differences due to race, ethnicity, gender, age, identity etc.	Follow all the skills in the workplace and society to have peace and harmony with superiors and subordinates.
15	**OJT (CP23212P)**			On the Job Training in the relevant sector

Annexure: Acronym and Glossary

Acronym

Acronym	Description
AA	Assessment Agency
AB	Awarding Body
ISCO	International Standard Classification of Occupations
NCO	National Classification of Occupations
NCrF	National Credit Framework
NOS	National Occupational Standard(s)
NQR	National Qualification Register
NSQF	National Skills Qualifications Framework
OJT	On the Job Training

Glossary

Term	Description
National Occupational Standards (NOS)	NOS define the measurable performance outcomes required from an individual engaged in a particular task. They list down what an individual performing that task should know and also do.
Qualification	A formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards
Qualification File	A Qualification File is a template designed to capture necessary information of a Qualification from the perspective of NSQF compliance. The Qualification File will be normally submitted by the awarding body for the qualification.
Sector	A grouping of professional activities on the basis of their main economic function, product, service or technology.
Long Term Training	Long-term skilling means any vocational training program undertaken for a year and above. https://ncvet.gov.in/sites/default/files/NCVET.pdf