QUALIFICATION FILE

Technician – Automation

☐ 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: 4.0

Submitted By:

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

Table of Contents

Section 1: Basic Details

1.	**Qualification Name**	**Technician – Automation**	
2.	**Sector/s**	Capital Goods and Manufacturing	
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:** Technician - Automation
4.	**a. OEM Name** ***b.*** **Qualification Name** (*Wherever applicable)*	NA	
5.	**National Qualification Register (NQR) Code & Version** (*Will be issued after NSQC approval)*	QG-04-CG-01039-2023-V1-NTTF	**6. NCrF/NSQF Level: 4.0**
7.	**Award (Certificate/Diploma/Advance Diploma/ Any Other** *(Wherever applicable specify multiple entry/exits & provide details in annexure)*	Certificate	
8.	**Brief Description of the Qualification**	Troubleshooting and maintenance of power devices and circuits in domestic and industrial applications. Trouble and maintain Electrical, Electronic Component/Equipment and their Appliances in the Industry. Troubleshooting and maintenance of power devices and circuits in domestic and industrial applications. The subjects covered in this program are – Industrial Electrical, Material Technology, Sensors and Transducers, PCB Design, CNC Technology, Industrial Electrical Lab, Sensors and Transducers Lab, CNC Lab, Computer Programming, Industrial Electronics, Mechanical Drive System, Microcontrollers and Applications, Jigs and Fixtures, Computer Programming Lab, Industrial Electronics Lab, Microcontrollers and Applications Lab, OJT & Employability Skills.	

<table>
<tr><td>9.</td><td>Eligibility Criteria for Entry for Student/Trainee/Learner/Employee</td><td colspan="2">a. Entry Qualification & Relevant Experience:
<table>
<tr><th>Sl. No.</th><th>Academic/Skill Qualification (with Specialization - if applicable)</th><th>Required Experience (with Specialization)</th></tr>
<tr><td>1</td><td>12th Pass with Mathematics
OR
After 10th Pass 2 years ITI Candidates of the following trades: Maintenance Mechanic (Chemical Plant), Technician Medical Electronics, Instrument Mechanic (Chemical Plant), Instrument Mechanic, Technician Mechatronics, Textile Mechatronics.
OR
After 10th Pass completed 2 years diploma in relevant trade
OR
Certificate – Assistant Technician – Automation (Level 3.5) from NTTF</td><td>NA</td></tr>
</table></td></tr>
<tr><td>10.</td><td>Credits Assigned to this Qualification, Subject to Assessment
(as per National Credit Framework (NCrF))</td><td>Total Credits – 43</td><td>11. Common Cost Norm Category (I/II/III)
(Wherever applicable): NA</td></tr>
<tr><td>12.</td><td>Any Licensing requirements for Undertaking Training on This Qualification (wherever applicable)</td><td colspan="2">NA</td></tr>
<tr><td>13.</td><td>Training Duration by Modes of Training Delivery
(Specify Total Duration as per selected training delivery modes and as per requirement of the qualification)</td><td colspan="2">☐ Offline ☐ Online ☑ Blended
<table>
<tr><th>Training Delivery Modes</th><th>Theory (Hours)</th><th>Practical (Hours)</th><th>OJT Mandatory (Hours)</th><th>OJT Recommended (Hours)</th><th>Total (Hours)</th></tr>
<tr><td>Classroom (offline)</td><td>280</td><td>150</td><td>690</td><td>-</td><td>1120</td></tr>
<tr><td>Online</td><td>170</td><td></td><td></td><td></td><td>170</td></tr>
</table>
(Refer Blended Learning Annexure for details)</td></tr>
<tr><td>14.</td><td>Aligned to NCO/ISCO Code/s
(if no code is available mention the same)</td><td colspan="2">NCO Code – 2015.3114.0100, 2015.7311.0101,2015.2141.0200, 2015.7412.0101</td></tr>
<tr><td>15.</td><td>Progression path after attaining the qualification
(Please show Professional and Academic progression)</td><td colspan="2">Academic Progression: Diploma in Industrial Automation</td></tr>
<tr><td>16.</td><td>Other Indian languages in which the Qualification & Model Curricula are being submitted</td><td colspan="2">Hindi</td></tr>
</table>

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 (10% seats are reserved)	
20.	**Are Greening/ Environment Sustainability Aspects Covered (Specify the NOS/Module which covers it)**	**☑ Yes ☐ No Safety Health and Environment Module Code: CP36604T**	
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 No.:** 9844013448 **Website: nttftrg.com**	
23.	**Final Approval Date by NSQC: 29 Sep 2023**	**24. Validity Duration: 3 years**	**25. Next Review Date: 29 Sep 2026**

Section 2: Module Summary

Modules/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 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 *(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)
Semester – 3																
1	Industrial Electrical	CP36301T	Core	4	22	45	-	-	-	45	100	-	-	-	100	
2	Material Technology	CP36302T	Core	4		40	-	-	-	40	100	-	-	-	100	
3	Sensors and Transducers	CP36303T	Core	4		45	-	-	-	45	100	-	-	-	100	
4	PCB Design	CP36304T	Core	4		35	-	-	-	35	100	-	-	-	100	
5	CNC Technology	CP36305T	Core	4		45	-	-	-	45	100	-	-	-	100	
6	Industrial Electrical Lab	CP36306P	Core	4		-	15	-	-	15	-	75	-	25	100	
7	Sensors and Transducers Lab	CP36307P	Core	4		-	15	-	-	15	-	75	-	25	100	
8	PCB Design Lab	CP36308P	Core	4		-	15	-	-	15	-	75	-	25	100	
9	CNC Lab	CP36309P	Core	4		-	15	-	-	15	-	75	-	25	100	
10	OJT	CP36310P	Core	4		-	-	360	-	360	-	75	-	25	100	
11	Employability Skills	CP36311T	Core	4		30	-	-	-	30	75	-	-	25	100	
Duration (in Hours)/ Total Marks					**22**	**240**	**60**	**360**	-	**660**	**575**	**375**	-	**150**	**1100**	
Semester – 4																
12	Computer Programming	CP36401T	Core	4	21	30	-	-	-	30	100	-	-	-	100	
13	Industrial Electronics	CP36402T	Core	4		40	-	-	-	40	100	-	-	-	100	
14	Mechanical Drive System	CP36403T	Core	4		30	-	-	-	30	100	-	-	-	100	
15	Microcontrollers and Applications	CP36404T	Core	4		40	-	-	-	40	100	-	-	-	100	
16	Jigs and Fixtures	CP36405T	Core	4		40	-	-	-	30	100	-	-	-	100	
17	Computer Programming Lab	CP36406P	Core	4		-	20	-	-	20	-	75	-	25	100	
18	Industrial Electronics Lab	CP36407P	Core	4		-	40	-	-	40	-	75	-	25	100	

19	Microcontrollers and Applications Lab	CP36408P	Core	4		-	30	-	-	30	-	75	-	25	100	
20	OJT	CP36409P	Core	4		-	-	330	-	330	-	75	-	25	100	
21	Employability Skills	CP36410T	Core	4		30	-	-	-	30	75	-	-	25	100	
Duration (in Hours)/ Total Marks					**21**	**210**	**90**	**330**		**630**	**575**	**300**	-	**125**	**1000**	
TOTAL					**43**	**450**	**150**	**690**		**1290**	**1150**	**675**		**175**	**2100**	

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)*

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

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 of 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*	Theory and practical (offline)
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 Resource requirement for skill encompassed in Industrial automation/Mechatronics Engineering for the Manufacturing, Capital Goods and Automotive Industries. a. MSDE Annual Report 2021- 22 predict very high growth on Auto sector, Food processing, Electronics and IT Hardware, Pharmaceuticals, Health care, Communication in India. b. MSDE/ NSDC Human Resources and Skill Requirements in the Auto and Auto Components Sector report (2013- 2017 2017 – 2022) The Report Forecast a Higher growth in Automotive Manufacturing, Automotive Components Manufacture Sector c. 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 Industrial Automation/Mechatronics Engineers.
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 a. Indian Skills Report 2021-22 by **Wheebox** - partnered **CII** predicts skill requirement in Engineering and Manufacturing sectors, Pharma and Health care sector. b. 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 –** a. Study on Job Role of the Future by Indian Institute of Skills. b. National Policy for skill Development and Entrepreneurship 2015 by MSDE has predicted skilled manpower requirement across key sectors by 2022. c. The Study has found Industrial Automation, Embedded System Developers, 3D Printing Technician has new job roles emerging in Engineering and Manufacturing sectors.
4.	**Number of Industry validation provided: 7**
5.	**Estimated nos. of persons to be trained and employed: 5000 / 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 and 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 and 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:** Assessment SOP (Mandatory)	Yes (Annexure 10)
13.	**Supporting Document:** Occupational Map (Mandatory)	Yes (Annexure 11)
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	Describe the properties of Engineering materials and use. Describe different mechanics, drives and maintenance procedures. Explain the Working of sensors & transducers Explain syntax and programming of C and Python Describe the construction of different power devices, analysis of different power circuits. Explain various types of Jigs and Fixtures Programming and operating and basic Maintenance of CNC machines.	Application of ferrous, non-ferrous metals, alloys, insulators and conductors Maintenance of mechanics and drives of equipments in industry. Identification, Specification and Selection of Mechanical, Electrical and Proximity Sensors Troubleshooting and maintenance of power devices and circuits in domestic and industrial applications. Provide Specification and Application of suitable Materials and their Heat Treatment Generate CAM programs using CAM. Execution of Programs on CNC Milling and Lathe Machines.	**4.0**
Professional and Technical Skills/ Expertise/ Professional Knowledge	Describe PCB Design and Fabrication using application software. Explain the architecture, codes and perform programming of different Micro-controllers. Explain Computer programming using C and Python Describe the construction and characteristics of different sensors and transducers.	Trouble and maintain Electrical, Electronic Component/Equipment and their Appliances in the Industry. Proficiency in Schematic and layout design using software Design and develop any microcontroller application circuits Perform Maintenance and troubleshooting of Power Systems Perform Data analysis and management in	**4.0**

	Specify and Use Electrical and Electronics Components and Equipment Explain Mechanical Drive systems, Control Electrical Drives and Systems. Perform machining operations using various Conventional, Non-conventional and Special purpose machines and check quality.	automation industry Machining of elements using conventional milling, turning, grinding machines	
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	Explain Diversity, inclusion, gender sensitivity. Describe Goal setting and career development. Describe Analytical thinking and adaptive thinking. Explain about Financial and Legal literacy. Specify Occupational Safety, Health, and Environment education.	Propagate inclusiveness and team working. Propagate Personal development and team building. Developing creativity and reasoning, making decisions in dynamically challenging situations. Good understanding of various statutory and legal benefits and requirements of an employee. Knowledge of Occupational safety hazards and methods to mitigate them.	**4.0**
Broad Learning Outcomes/Core Skill	Practical hands-on experience on Power electronics Perform programming of Micro-controller and its applications Describe Mechanical Drive systems, Control Electrical Drives and Systems. Explain the function of Jigs and Fixtures	Maintenance and troubleshooting of Power Systems. Maintenance of Instrumentation Process control systems. Familiarize with different types of jig and fixtures	**4.0**
Responsibility	Awareness of safety Procedures and SOPs in the relevant work area. Identify, monitor and report occurrences in the work area.	Work effectively in any component assembly. Assist Maintenance activity in industry. Can work independently.	**4.0**

Annexure 2: Tools and Equipment (Lab Set-Up)
List of Tools and Equipment for a batch of 30 trainees

SL. NO.	NAME OF THE TOOL AND EQUIPMENT	SPECIFICATION	QUANTITY
1	Digital Oscilloscope	No of Channels - 2, Bandwidth: DC - 20 MHz	03
2	Dual - Power Supplies Regulated Power Supply, Adjustable	0-30V/1A	03
3	Function Generator	Frequency Range: 0.3 Hz to 3 MHz, Functions: Sine, Square, Triangle, DC Sweep	03
4	Pulse Generator	20MHz	02
5	Soldering Station - Temperature Controllable		01
6	LCR - Q Bridge		01
7	IC Tester (for Digital IC's)		01
8	Digital Trainer Kit	Fixed +5V/ 1Amp, 16pin ZIF Socket, Logical switch with I/O Indicators, 4mm patch cords with short circuit and Overload Protection.	03
9	Soldering Iron	20W	02
10	Fuse	HRC 16A with Holders	03
11	MCB	2 pole, 10A/9kA, C type	03
12	Crimping tool		01
13	AC Drive / VFD		01
14	DC Drive		01
15	Force measuring system	Load Cell 20 kg With Instrumentation Amplifier and Digital Display.	01
16	Digital Temperature Controller	Digital Temperature Controller Compatible to Connect J, K Thermo / Couple and RTD	01
17	Proximity Sensors	Inductive, Capacitive and Optical Proximity Sensor	01each

18	PLC Trainer Kit with HMI SCADA	CPU, 24VDC Supply, Onboard IO- 14, DI 24V, 10 DO relay 0.5A, 2 AI 0-10 VDC, Power Supply AC 85VAC – 264VAC @47 to 63 Hz, program memory 64 KB.	02
19	Sensor Trainer Kit with Assorted Sensors		02
20	Compressor	Compressor- Reciprocating Air Compressor - 2 stage/2 Cylinder with 3 phase motor capacity 8CFM, Air Receiver Size- 160l	01
21	Pneumatic Trainer Kit		01
22	Hydraulic Trainer Kit		01
23	Robotic Trainer		01
24	Microcontroller Trainer Kit	8051 /AT89S52 Development Board with Interfacing Modules.	03
25	IoT Trainer Kit		01
26	PIC Development Board	16F877A Board with Interfacing modules	03
27	PIC Kit 3		01
28	Pneumatic Simulation Software -10 User		01
29	Hydraulic Simulation Software - 10 User		01
30	PLC Simulation Software - 10 User		01
31	Robot Simulation Software -10 User		01
32	Computer		10
MECHANICAL TOOLS			
33	Workbench with Lockers - 4 Vices/Bench	1.5mX0.8mX0.7m	03
34	Bench Vice	125mm	10
35	Set of files		10
36	Vernier caliper	150mm, LC 0.02	05
37	Micrometer (External)	0-25mm	03
38	Bevel Protractor		02
39	Radius Gauge	up to 7.5mm	02

40	Feeler Gauge	13 leaves150mm long	02
41	Scriber		05
42	Centre Punch	60° & 90°	05
43	Try Square	100 mm x 75 mm	10
44	Hack Saw with Blade	300 mm	10
45	Hammer	500 g	03
46	Cast Iron Surface Plate	600mm X 450mm with Stand	01
47	Angle Plate	250mm X 150mm X 175mm	01
48	V - Blocks	150mm X 100mm X 60mm	01
49	Vernier Height Gauge	600mm	01
50	Nose plier	Long Nose – 170mm	01
51	Screwdriver Set		01
52	Allen Key Set (mm sizes)		01
53	Adjustable Spanners	70/ 30	01
54	Bench Drilling Machine with Accessories	0-12mm	01
55	Power hacksaw	350 mm	01
56	CNC Lathe machine with Accessories and Servo Stabiliser		01
57	CNC Milling machine with Accessories and Servo Stabiliser		01
58	CNC Simulation Software	10 user license	01
59	Compressor	Compressor- Reciprocating Air Compressor - 2 stage/2 Cylinder with 3 phase motor capacity 8CFM, Air Receiver Size- 160l	01
Equipment's / Machineries available where OJT is being conducted			

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 the 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
1	Tata Motors Limited, Pune	Rajiv Ranjan	Dy. GM-Human Resources	Tata Motors Passenger Vehicles Ltd, Sector 15 & 15A, PCNTDA, Chikhali, Pune 411062	7781016451	rajiv.ranjan@tatamotors.com	www.linkedin.com/in/rajiv-ranjan-a769229
2	Tata Motors Limited, Jamshedpur	Rajiv Ranjan	Dy. GM-Human Resources	Tata Motors Passenger Vehicles Ltd, Sector 15 & 15A, PCNTDA, Chikhali, Pune 411062	7781016451	rajiv.ranjan@tatamotors.com	www.linkedin.com/in/rajiv-ranjan-a769229
3	Tata Motors Limited, Lucknow	Rajiv Ranjan	Dy. GM-Human Resources	Tata Motors Passenger Vehicles Ltd, Sector 15 & 15A, PCNTDA, Chikhali, Pune 411062	7781016451	rajiv.ranjan@tatamotors.com	www.linkedin.com/in/rajiv-ranjan-a769229
4	Tata Motors Limited, Pantnagar	Rajiv Ranjan	Dy. GM-Human Resources	Tata Motors Passenger Vehicles Ltd, Sector 15 & 15A, PCNTDA, Chikhali, Pune 411062	7781016451	rajiv.ranjan@tatamotors.com	www.linkedin.com/in/rajiv-ranjan-a769229
5	Tata Motors Limited, Dharwad	Rajiv Ranjan	Dy. GM-Human Resources	Tata Motors Passenger Vehicles Ltd, Sector 15 & 15A, PCNTDA, Chikhali, Pune 411062	7781016451	rajiv.ranjan@tatamotors.com	www.linkedin.com/in/rajiv-ranjan-a769229
6	Tata Motors Passenger Vehicles Limited, Pune	Rajiv Ranjan	Dy. GM-Human Resources	Tata Motors Passenger Vehicles Ltd, Sector 15 & 15A, PCNTDA, Chikhali, Pune 411062	7781016451	rajiv.ranjan@tatamotors.com	www.linkedin.com/in/rajiv-ranjan-a769229
7	Tata Motors Passenger Vehicles Limited, Sanand	Rajiv Ranjan	Dy. GM-Human Resources	Tata Motors Passenger Vehicles Ltd, Sector 15 & 15A, PCNTDA, Chikhali, Pune 411062	7781016451	rajiv.ranjan@tatamotors.com	www.linkedin.com/in/rajiv-ranjan-a769229

Annexure 4: Training and 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	7500	More than 12,000	750	More than 2000	-	-
2024	8200	More than 13,000	820	More than 2000	-	-
2025	9000	More than 14,000	900	More than 2000	-	-

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	Trained	Assessed	Certified	Placed
New Qualification	2017 - 2020	**New Qualification, introduced in the year 2023.**-								NIL			
	2018 - 2021												
	2019 - 2022												

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: NA

Content availability for 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	75:25
2	Imparting Soft Skills, Life Skills, and Employability Skills /Mentorship to Learners	Physical classroom, Workshops, Mock sessions, Case study, Role play, Group Discussions, LMS	95:05
3	Showing Practical Demonstrations to the learners	Workshop / Lab, Video recording, Simulators	100:0
4	Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	Workshop machines, Lab equipment, Simulators, Mini projects, Project	90:10
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	100:0
7	On the Job Training (OJT)/ Project Work Internship/ Apprenticeship Training	Industry	100:0

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 – 3					
Industrial Electrical	Fundamentals of AC	7.5	-	-	-
	Single Phase and Three Phase circuits	7.5	-	-	-
	Electrical Protective Devices-Fuse,MCB,ELCB ,Specification & Applications	10	-	-	-
	Wires and Cables-Types, Specification & Applications	10	-	-	-
	Industrial Switches-Types, Specification & Applications	10	-	-	-
	AC/DC Generators-Types, Specification & Applications	10	-	-	-
	DC Motors-Types, Specification & Applications	10	-	-	-
	AC Motors-Types, Specification & Applications	10	-	-	-
	Speed Control of Motors-Methods Used	10	-	-	-
	AC and DC Drives- Types, Specification & Applications	15	-	-	-
	Total Marks	100			
Material Technology	Properties of Materials-Physical, Mechanical, Electrical	10	-	-	-
	Basics of strength of Material-Stress, Strain, Modulus of Rigidity, Modulus of Elasticity	15	-	-	-
	Ferrous Metals-Classification, Specification, Application	15	-	-	-
	Standard Steel Section and Sheets – Referring Standards	10	-	-	-
	Non – Ferrous Metals and Alloys-Different Types ,Properties, Applications	15	-	-	-
	Plastics -Types, Specification & Applications	15	-	-	-
	Insulators-Types, Specification & Applications	10	-	-	-

	Conductors-Types, Specification & Applications	10	-	-	-
	Total Marks	100			
Sensors and Transducers	Mechanical Transducers-Types, Specification & Applications	25	-	-	-
	Electrical Transducers-Types, Specification & Applications	25	-	-	-
	Proximity Sensors-Types, Specification & Applications	25	-	-	-
	Feed Back Instruments-Types, Specification & Applications	25	-	-	-
	Total Marks	100			
PCB Design	Introduction to PCB and Autodesk Eagle software	20	-	-	-
	Schematics design and Library functions	25	-	-	-
	PCB Layout general Rules & parameters	25	-	-	-
	Layout Design	30	-	-	-
	Total Marks	100			
CNC Technology	Introduction to CNC	10	-	-	-
	Safety-Workshop safety, Machine Safety	05	-	-	-
	CNC Hardware Basics	10	-	-	-
	Part Programming in CNC Milling	20	-	-	-
	Part Programming in CNC Lathe	15	-	-	-
	CNC Tooling	10	-	-	-
	CNC work holding device	10	-	-	-
	Introduction to CAD/CAM	20	-	-	-
	Total Marks	100			
Employability Skills	Diversity and Inclusion, Gender sensitivity PwD etc.	20	-	-	5
	Career development and Goal setting	20	-	-	5
	Entrepreneurship	15	-	-	10
	Analytical thinking and Adaptive Thinking	20	-	-	5
	Total Marks	100			

Industrial Electrical Lab	Electrical protective devices - Fuse, MCB, MLCB, RLCB	10	-	-	5
	Types of switches	5	-	-	5
	Wires and cables	5	-	-	5
	Transformers	10	-	-	-
	AC and DC Motors - Starters	20	-	-	-
	AC and DC drives Speed control of AC motors Speed control of DC motors VFD	25	-	-	10
	Total Marks	100			
Sensors and Transducers Lab	Mechanical sensors –Thermocouple, Load cell, Identification, Specification & applications	-	25	-	5
	Electrical transducer –Strain Gauge, Photoelectric - Identification, Specification & application	-	25	-	10
	Proximity Sensors –Reed Sensor, Inductive, Capacitive, Optical proximity sensor Identification, Specification & application	-	25	-	10
	Total Marks	100			
PCB Design Lab	Schematic Design exercises	-	25	-	10
	Layout Design exercises	-	50	-	15
	Total Marks	100			
CNC Lab	Familiarization of CNC lathe and CNC milling machine	-	15	-	5
	Try out of CNC program Turning	-	30	-	10
	Try out of CNC program Milling	-	30	-	10
	Total Marks	100			
OJT	On the Job Training in the relevant sector	-	75	-	25
	Total Marks	100			
Semester – 4					
Computer Programming	Programming in C	50	-	-	-
	Introduction to Python Programming	50	-	-	-
	Total Marks	100			

Industrial Electronics	Introduction	10	-	-	-
	Power Semiconductor devices	15	-	-	-
	Inverters-Types, Specification ,Application	20	-	-	-
	Power supplies -Types, Specification ,Application	20	-	-	-
	UPS-Types, Specification ,Application	15	-	-	-
	Electromechanical devices-Types, Specification ,Application	15	-	-	-
	Handling of Electronic components-Care to be taken while	05	-	-	-
	Total Marks	100			
Mechanical Drive System	Lubrication -Types, Specification ,Application	10	-	-	-
	Belt and Chain Drives-Types, Specification ,Application, RPM Calculation	15	-	-	-
	Gears and Gear Drives-Types, Specification ,Application, RPM Calculation	15	-	-	-
	Cams-Types & Applications	10	-	-	-
	Conveyors-Types & Applications	10	-	-	-
	Bearings Types, Specification ,Application ,Care & Maintenance	20	-	-	-
	Keys -Types, Specification ,Application	5	-	-	-
	Couplings-Types, Specification ,Application	15	-	-	-
	Total Marks	100			
Microcontrollers and Applications	Introduction to Microcontrollers and RISC and CISC architecture	10	-	-	-
	Architecture of 8051	10	-	-	-
	Programming to 8051	15	-	-	-
	Peripheral of 8051 and Interfacing	15	-	-	-
	Basic features of PIC 16F877A Microcontroller	10	-	-	-
	Architecture and Memory organization of PIC Microcontroller	10	-	-	-
	In-built Peripherals of PIC - Timer, ADC, USART	15	-	-	-
	Programming of PIC Microcontroller	15	-	-	-
	Total Marks	100			

Jigs and Fixtures	Jigs and Fixtures-Definition, Advantages & Applications	15	-	-	-
	Types of jigs and fixtures	30	-	-	-
	Machine relation-Fixture, Jig	15	-	-	-
	Elements of jigs and fixtures	25	-	-	-
	Materials and heat treatment on jigs and fixtures elements	15	-	-	-
	Total Marks	100			
Employability Skills	Financial and Legal Literacy	20	-	-	5
	Occupation safety, Health, and Environment education	20	-	-	5
	Digital Literacy Skills	20	-	-	5
	Essential skills for success	15	-	-	10
	Total Marks	100			
Computer Programming Lab	Programming Exercises in C	-	35	-	15
	Programming Exercises in Python	-	40	-	10
	Total Marks	100			
Industrial Electronics Lab	VI characteristics of SCR, TRIAC	-	15	-	5
	Reverse Recovery of Diode	-	10	-	
	Switching characteristics of IGBT	-	10	-	5
	UJT as a relaxation oscillator and SCR firing circuits using UJT	-	15	-	5
	Series and parallel inverters	-	15	-	5
	PWM signal Generator-Familiarization, Application		10	-	5
	Total Marks	100			
Microcontrollers and Applications Lab	Basics programming of 8051 Microcontroller	-	15	-	10
	Interfacing of 8051 with LED, SSD, LCD	-	20	-	5
	Basics programming of PIC Microcontroller	-	20	-	5
	Interfacing of peripherals and programming of PIC - Keypad, ADC and serial communication	-	20	-	5
	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 Criteria for assessment based on Modules, 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 and 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 of 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 and 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 with Examiners under the overall supervision of the Assessment & Evaluation Dept.
Evaluation of Theory and Practical examination is carried out by the Trained Assessors (NTTF faculty members) under the supervision of Shopfloor Manager / Principal 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.
Assessors / Faculties are trained from time to time to upgrade their skills on various aspects such as conduction of assessments, teaching methodology etc.

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
- 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 conduction of assessments, teaching methodology etc.

3. ELIGIBILITY TO APPEAR FOR THE EXAM:

- The candidates should have an attendance of a minimum 80% in a semester.
- The candidates should have secured minimum Sessional Marks in Theory and 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 customers, understanding needs and requirements, assessing the customer and perform Soft Skills effectively:
   - Videos of Trainees during OJT
3. Assessment will ensure that the candidate is able to:
   - 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:

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

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

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 help 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

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 – 3	Module Name: Industrial Electrical	Module Code: CP36301T
Sl. No.	**Module Details**	**Theory Hours 45**
1	Fundamentals of AC	4h
2	Single Phase and Three Phase circuits	4h
3	Electrical Protective Devices	4h
4	Wires and Cables	4h
5	Industrial Switches	4h
6	AC/DC Generators	5h
7	DC Motors	5h
8	AC Motors	5h
9	Speed Control of Motors	5h
10	AC and DC Drives	5h
	Total Hours	**45h**

Semester – 3	Module Name: Material Technology	Module Code: CP36302T
Sl. No.	**Module Details**	**Theory Hours 40**
1	Properties of Materials	5h
2	Basics of strength of Material	12h
3	Ferrous Metals	5h
4	Standard Steel Section and Sheets – Referring Standards	5h
5	Non – Ferrous Metals and Alloys	4h
6	Plastics	4h
7	Insulators	3h
8	Conductors	2h
	Total Hours	**40h**

Semester – 3	Module Name: Sensors and Transducers	Module Code: CP36303T
Sl. No.	**Module Details**	**Theory Hours 45**
1	Mechanical Transducers	12h
2	Electrical Transducers	12h
3	Proximity Sensors	9h
4	Feed Back Instruments	12h
	Total Hours	**45h**

Semester – 3	Module Name: PCB Design	Module Code: CP36304T
Sl. No.	**Module Details**	**Theory Hours 35**
1	Introduction to PCB and Autodesk Eagle software	5h
2	Schematics design and Library functions	10h
3	PCB Layout general Rules & parameters	8h
4	Layout Design	12h
	Total Hours	**35h**

Semester – 3	Module Name: CNC Technology	Module Code: CP36305T
Sl. No.	**Module Details**	**Theory Hours 45**
1	Introduction to CNC	4h
2	Safety	4h
3	CNC Hardware Basics	5h
4	Part Programming in CNC Milling	8h
5	Part Programming in CNC Lathe	8h
6	CNC Tooling	4h
7	CNC work holding device	4h
8	Introduction to CAD/CAM	8h
	Total Hours	**45h**

Semester – 3	Module Name: Industrial Electrical Lab	Module Code: CP36306P
Sl. No.	**Module Details**	**Practical Hours 15**
1	Electrical protective devices - Fuse, MCB, MLCB, RLCB	2h
2	Types of switches	2h
3	Wires and cables	2h
4	Transformers	3h
5	AC and DC Motors – Starters	3h
6	AC and DC drives Speed control of AC motors Speed control of DC motors VFD	3h
	Total Hours	**15h**

Semester – 3	Module Name: Sensors and Transducers Lab	Module Code: CP36307P
Sl. No.	**Module Details**	**Practical Hours 15**
1	Mechanical sensors – Identification and Specification – Thermocouple, Load cell	5h
2	Electrical transducer – Identification and Specification – Strain Gauge, Photoelectric	4h
3	Proximity Sensors – Identification and Specification – Reed Sensor, Inductive, Capacitive, Optical proximity sensor	6h
	Total Hours	**15h**

Semester – 3	Module Name: PCB Design Lab	Module Code: CP36308P
Sl. No.	**Module Details**	**Practical Hours 15**
1	Schematic Design exercises	6h
2	Layout Design exercises	9h
	Total Hours	**15h**

Semester – 3	Module Name: CNC Lab	Module Code: CP36309P
Sl. No.	**Module Details**	**Practical Hours 15**
1	Familiarization of CNC lathe and CNC milling machine	3h
2	Try out of CNC program Turning	6h
3	Try out of CNC program Milling	6h
	Total Hours	**15h**

Semester – 3	Module Name: OJT	Module Code: CP36310P
Sl. No.	**Module Details**	**Practical Hours 360**
1	On the Job Training in the relevant sector	360h
	Total Hours	**360h**

Semester - 3	Module Name: Employability Skills	Module Code: CP36311T
Sl. No.	**Module Details**	**Theory Hours 30**
1	Diversity and Inclusion, Gender sensitivity PwD etc.	8h
2	Career development and Goal setting	7h
3	Entrepreneurship	8h
4	Analytical thinking and Adaptive Thinking	7h

	Total Hours	**30h**

Semester – 4	**Module Name: Computer Programming**	**Module Code: CP36401T**
Sl. No.	**Module Details**	**Theory Hours 30**
1	Programming in C	15h
2	Introduction to Python Programming	15h
	Total Hours	**30h**

Semester – 4	**Module Name: Industrial Electronics**	**Module Code: CP36402T**
Sl. No.	**Module Details**	**Theory Hours 40**
1	Introduction	5h
2	Power Semiconductor devices	6h
3	Inverters	6h
4	Power supplies	8h
5	UPS	5h
6	Electromechanical devices	6h
7	Handling of Electronic components	4h
	Total Hours	**40h**

Semester – 4	**Module Name: Mechanical Drive System**	**Module Code: CP36403T**
Sl. No.	**Module Details**	**Theory Hours 30**
1	Lubrication	4h
2	Belt and Chain Drives	4h
3	Gears and Gear Drives	4h
4	Cams	4h
5	Conveyors	3h
6	Bearings	4h
7	Keys	3h

8	Couplings	4h
	Total Hours	**30h**

Semester – 4	**Module Name: Microcontrollers and Applications**	**Module Code: CP36404T**
Sl. No.	**Module Details**	**Theory Hours 40**
1	Introduction to Microcontrollers and RISC and CISC architecture	2h
2	Architecture of 8051	2h
3	Programming to 8051	7h
4	Peripheral of 8051 and Interfacing	8h
5	Basic features of PIC 16F877A Microcontroller	2h
6	Architecture and Memory organization of PIC Microcontroller	3h
7	In-built Peripherals of PIC - Timer, ADC, USART	8h
8	Programming of PIC Microcontroller	8h
	Total Hours	**40h**

Semester – 4	**Module Name: Jigs and Fixture**	**Module Code: CP36405T**
Sl. No.	**Module Details**	**Theory Hours 30**
1	Jigs and Fixtures	10h
2	Types of jigs and fixtures	10h
3	Machine relation	4h
4	Elements of jigs and fixtures	4h
5	Materials and heat treatment on jigs and fixtures elements	2h
	Total Hours	**30h**

Semester – 4	**Module Name: Computer Programming Lab**	**Module Code: CP36406P**
Sl. No.	**Module Details**	**Practical Hours 20**

1	Programming Exercises in C	10h
2	Programming Exercises in Python	10h
	Total Hours	**20h**

Semester – 4	**Module Name: Industrial Electronics Lab**	**Module Code: CP36407P**
Sl. No.	**Module Details**	**Practical Hours 40**
1	VI characteristics of SCR, TRIAC	6h
2	Reverse Recovery of Diode	6h
3	Switching characteristics of IGBT	6h
4	UJT as a relaxation oscillator and SCR firing circuits using UJT	8h
5	Series and parallel inverters	8h
6	PWM signal Generator	6h
	Total Hours	**40h**

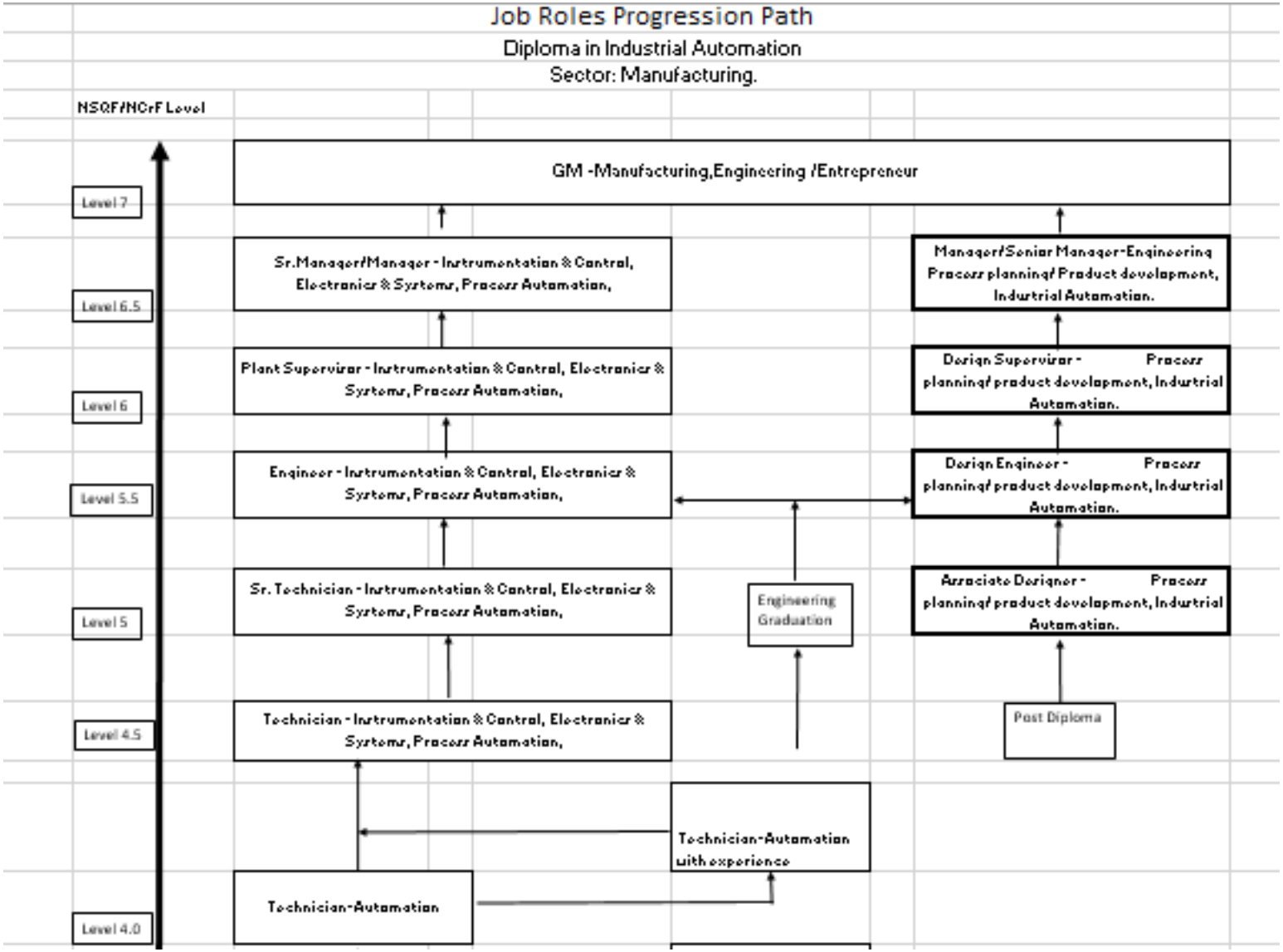
Semester – 4	**Module Name: Microcontrollers and Applications Lab**	**Module Code: CP36408P**
Sl. No.	**Module Details**	**Practical Hours 30**
1	Basics programming of 8051 Microcontroller	6h
2	Interfacing of 8051 with LED, SSD, LCD	9h
3	Basics programming of PIC Microcontroller	6h
4	Interfacing of peripherals and programming of PIC - Keypad, ADC and serial communication	9h
	Total Hours	**30h**

Semester – 4	**Module Name: OJT**	**Module Code: CP36409P**
Sl. No.	**Module Details**	**Practical Hours 330**
1	On the Job Training in the relevant sector	330h
	Total Hours	**330h**

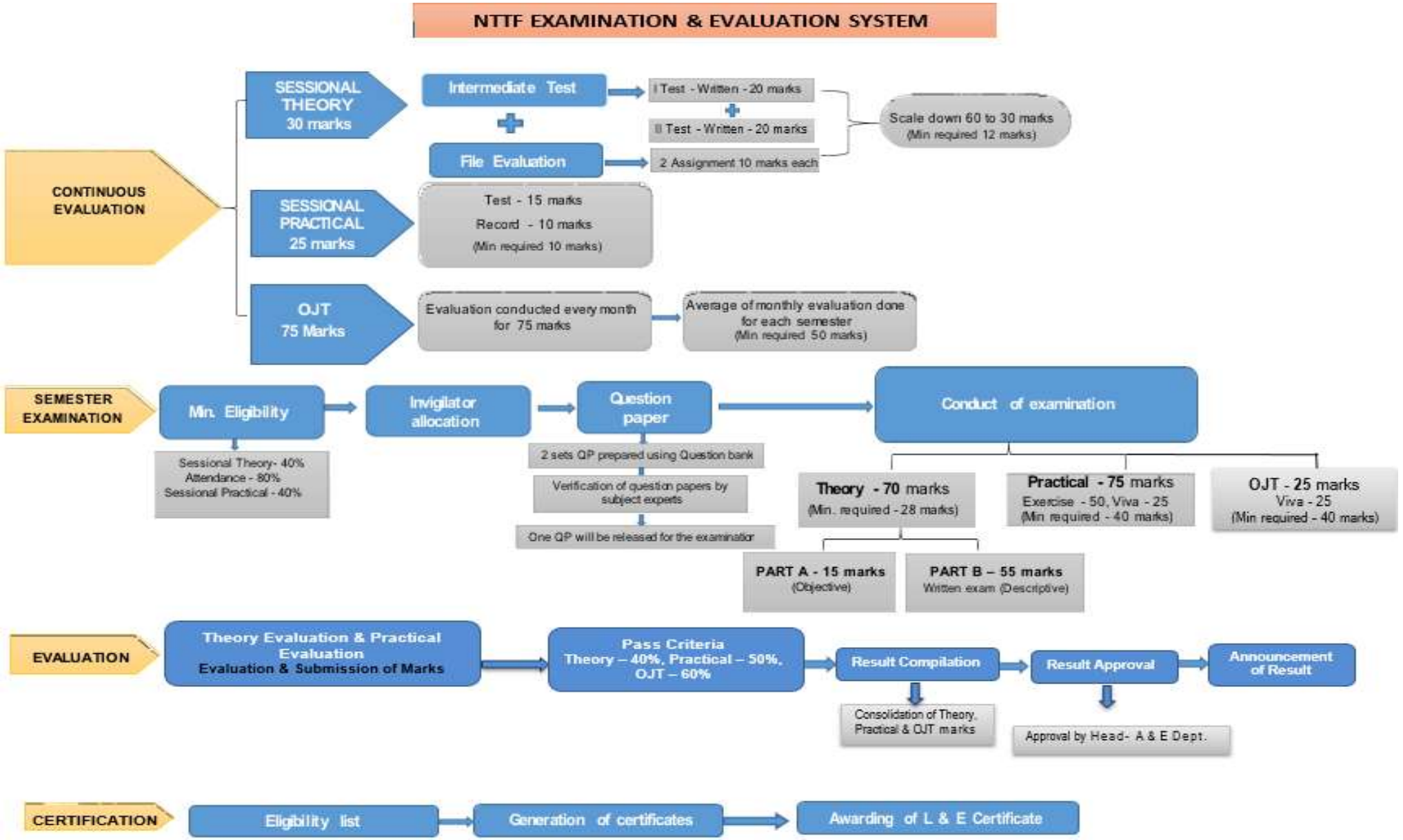
Semester - 4	**Module Name: Employability Skills**	**Module Code: CP36410T**
Sl. No.	**Module Details**	**Theory Hours 30**
1	Financial and Legal Literacy	9h

2	Occupation safety, Health, and Environment education	6h
3	Digital Literacy Skills	8h
4	Essential skills for success	7h
	Total Hours	**30h**

Annexure 9: Career Progression



Annexure 10: Assessment SOP



Annexure 11: Occupational Map

Occupational Map - Sector Name: Manufacturing

As per NCrF		As per NCO-2015	Sub-Sector 1/Automotive, Aerospace, Home appliances, Textile, Construction machinery	
NCrF Level (1-7)	**Level Descriptors**	**NCO-15 -- Family (First 4 digits code/s for the given level cross cutting the OM Sub-Sectors/Occupations)**	**Occupation 1**/Process control and instrumentation, maintenance.	**Occupation 2/ Industrial Automation planning and implementation. Product design and development.**
Level 7	**1.** Professional Theoretical Knowledge: **Advanced knowledge with critical understanding of emerging developments2. 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 5. Responsibility: Business Management (like GM/ CEO / CXO ,etc.)**	1321	GM - Manufacturing	GM - Engineering/ Entrepreneur
Level 6.5	**1.** Professional Theoretical Knowledge: A**dvanced multidisciplinary and specialized knowledge2. Professional and Technical Skills/ Expertise: Advanced Technical and Managerial Skills 3. Employment Readiness & Entrepreneurship Skills & Mind-set: Leadership, effective resource management 4. Broad Learning Outcomes: Judgement in complex problems**	1321,2144, 2152, 3114, 7412	Manager/ Sr. Manager - Instrumentation & Control, Electronics & Systems, Process Automation, Industrial Automation Engineering, Industrial Maintenance Engineering, Consumer Electronics.	Manager/Senior Manager-Engineering Process planning/ Product development, Industrial Automation.

	5. Responsibility: Vertical/ Business unit management –Manager or Senior Manager			
Level 6	**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, self-management 4. Broad Learning Outcomes: Judgement / decision making – specialized 5. Responsibility: Team leader – Assistant technical supervisor, technical supervisor or Assistant / deputy manager**	2152, 3114, 7412,2144	Plant Supervisor - Instrumentation & Control, Electronics & Systems, Process Automation, Industrial Automation Engineering, Industrial Maintenance Engineering, Consumer Electronics.	Design Supervisor - Process planning/ Product development, Industrial Automation.
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**	2152, 3114, 7412,2144,2141	Engineer - Instrumentation & Control, Electronics & Systems, Process Automation, Industrial Automation Engineering, Industrial Maintenance Engineering, Consumer Electronics.	Design Engineer - Process planning/ Product development , Industrial Automation.
Level 5		2152, 3114, 7412,	Senior Technician - Instrumentation & Control, Electronics & Systems, Process Automation, Industrial Automation Engineering, Industrial Maintenance Engineering, Consumer Electronics.	Associate Designer - Process planning/ product development, Industrial Automation.
Level 4.5	**1.** Professional Theoretical Knowledge: **Range of knowledge 2. Professional and Technical Skills/ Expertise: Range of technical skills 3. Employment Readiness &**	2152, 3114, 7412,8212	Technician - Instrumentation & Control, Electronics & Systems, Process Automation, Industrial Automation Engineering, Industrial Maintenance Engineering, Consumer Electronics.	Study Post Diploma

	Entrepreneurship Skills & Mind-set: Team readiness & Enterpreurial readiness-with guidance. **4. Broad Learning Outcomes: Carry out Range of tasks with minimum supervision** **5. Responsibility: Accountable/ responsible - Technician**			
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 supervision** **5. Responsibility: Accountable/ responsible - technician**	7311	Assistant Technician - Automation	
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 supervision.** **5. Responsibility: Accountable/ responsible - Jr. technician/Assistant**	3114	Technical Assistant-Automation	

Annexure 12: Key Learning Outcome

SL. NO.	SUBJECT NAME	KNOWLEDGE AND UNDERSTANDING	TECHNICAL & PROFESSIONAL SKILLS	APPLICATION OF KNOWLEDGE AND SKILLS
2nd Year				
1	**Industrial Electrical (CP36301T)** **Industrial Electrical Lab (CP36306P)** Understand electrical safety standards and regulations.	Aware of Electrical Safety Procedures. Identify and Specify Wires and Cables Identify, Specify and Use measuring instruments – Ammeter, Voltmeter, Multimeter and CRO Differentiate between Potential Difference and EMF Explain different types of Earthing and Purpose State Types and Applications of sensors Explain construction and working principle of Transformers	Identify and State Specification and Applications of Electrical hand tools Identify the specify Electrical Protective Devices Describe construction, Working, specifications, Applications and Speed Control of Induction motors Describe Working principle of Stepper and Servo motors Describe Construction, Working principle and applications of DC Motors	Knowledge of electrical machines, such as transformers, motors, and their operating principles. Knowledge of electrical safety standards and regulations.
2	**Material Technology (CP36302T)** Awareness on structure of Engineering Materials	Classify Engineering Materials Explain Properties of Materials Describe Various Types of Ferrous Metals Explain Types, Properties and Application of Cast Iron, Steel, Non -	Understand the properties, characteristics, and behaviour of various materials and their applications. State Types, Grades, Properties and Application of Stainless Steel Select Standard Steel Sections and	Knowledge of the physical, mechanical, and chemical properties of materials and how they relate to their performance in different applications. Knowledge on Properties, Specification and Application of Materials used in Industry.

		Ferrous metals and Alloys Differentiate between Thermoplastics and Thermoset Plastics Explain Testing of Hardness	Sheets State Types, Properties and Application of Thermoplastics State the Properties and application of hard materials	
3	**Sensors and Transducers (CP36303T)** **Sensors and Transducers Lab (CP36307P)** Applications of various sensors and Transducers	Knowledge and understanding on construction and working of mechanical, electrical and proximity sensors. Understanding on feedback elements.	Explain the working principle of various sensors and transducers.	Identification and specification of Mechanical, Electrical, proximity sensors and transducers.
4	**PCB Design (CP36304T)** **PCB Design Lab (CP36308P)** Ability to design and fabricate PCB for simple electronic applications.	Knowledge on Hardware and circuit components. Knowledge on types of Printed Wiring Boards. Introduction to PCB , Classification, Terminologies, THT and SMT Technologies	Design layout planning. Surface mount technology. PCB Design and Manufacturing Process of basic PCBs	Manufacturing of PCBs for simple applications. Identify defects in different soldering techniques, trouble shoot PCBs for defects in Automatic soldering process.
5	**CNC Technology (CP36305T)** **CNC Lab (CP36309P)** Write CNC program, execute different operations on CNC machine	Differentiate between NC, CNC and DNC Explain the elements and Functions of CNC Turning Center Explain the elements and Functions of VMC Explain materials for CNC Cutting Tools and their applications	Identify and Select Tools for CNC Lathe and CNC Milling Study and Familiarise tool catalogue Do Part Programming for Turning and Milling	Execution of Programs on CNC Milling and CNC Lathe Machines.

6	**Computer Programming (CP36401T)** **Computer Programming Lab (CP36406P)** Ability to create C programs for simple engineering applications	Introduction to Computer programming Introduction to C programming language Introduction to Python Programming	Execute overload functions and operators in C Python Object Oriented Programming	Programming Exercises in C Programming Exercises in Python
7	**Industrial Electronics (CP36402T)** **Industrial Electronics Lab (CP36407P)** Understanding on Power devices and power protection devices.	Understanding of construction and working of various motors. Power semiconductor devices. Knowledge on Electromechanical devices.	Construction and working of Inverters, power supplies, UPS. Handling Electronic components.	Identifying and selecting protective devices.
8	**Mechanical Drive System (CP36403T)** Understanding various types of Gears, Bearings, Cams, Couplings, Keys	Describe Types, Specification and Application of Lubricants Describe Types, Specification and Application of Gears and Gear Drives Explain Types, Specification and Application of Keys	Explain Types, Specification and Application of Belt Drives, Chain Drives. Gear Drives Types and Application of Cams	Describe Types, Specification and Application of Couplings Explain Types, Specification and Application of Bearings
9	**Microcontrollers and Applications (CP3604T)** **Microcontrollers and Applications Lab (CP36408P)**	Understanding on the architecture and programming of 8051 and other PIC microcontrollers. Knowledge on fuzzy logics.	Interfacing 8051 with other peripherals. Simple Programming on Microcontrollers using various programming software.	Application of 8051 in their work area Programming of PIC Microcontroller

	Write simple programs using 8051 and PIC Microcontrollers.		Interfacing sensors and display devices.	
10	**Jigs and Fixtures (CP36405T)** Understanding various types of Jigs and Fixtures, their parts, functions.	Explain the function of Jigs and Fixtures Differentiate between Jigs and Fixture Describe Advantages of Jigs and Fixtures Describe the freedom of movement of object Explain locating methods and locators Provide fool proofing in Jigs and Fixtures Describe different types of clamps and stoppers Explain types and application of different types of Jigs and Fixtures Explain different types of locating elements, drill bushes and setting elements	To learn the difference between jig and fixture. To learn concepts of location and clamping and different elements used for locating and clamping the work piece in a jig, fixture. Familiarize with different types of jig and fixtures	Ability to understand various types of jigs and fixtures and their parts and functions.
11	**OJT (CP36310P)** **OJT (CP36409P)**			On the Job Training in the relevant sector

12	**Employability Skills (CP36311T) (CP36410T)** Understand Entrepreneurship skills Ability to understand financial and legal aspects Understand Occupation safety, Health, and Environment related issues. Ability to use Essential skills.	Knowledge on various schemes and institutions promoting Entrepreneurs. Ways of setting enterprise, legal compliances, marketing, and budgeting etc. Knowledge and understanding on personal finance management, investments, returns, basics of taxes, awareness on financial frauds and prevention. Awareness on fundamental rights under the constitution and facilities available for recourse in the event of breach. Knowledge on Occupation safety and health, at workplace, Occupation Hazards, Accident prevention and PPEs, Environment, Pollution and protection of environment, Energy conservation, Global warming, Conservation of natural resources, waste management and disposal, Disaster Management. Understanding balancing Life and Career, Value based decision making, Types of stress and stress management.	Explain the schemes promoted by various support institutions. Budgeting and evaluations. Explain the Occupations hazards and process of mitigation of such hazards. PPEs. Explain environment conservation, and other factors affecting them.	Apply and impart details to other people in the society. Decide, plan and implement various financial management ideas, taxations and benefits and legal compliance in the workplace. Enforce caution against financial frauds and addressal of frauds. Follow all safety norms laid by the industry to develop a safe workplace. Practice stress management techniques to ensure high productivity in the work area.

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