



QUALIFICATION FILE

Senior Technician - Industrial 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: 4.5

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	Senior Technician - Industrial 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: Senior Technician - Industrial 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-4.5-CG-01040-2023-V1-NTTF		6. NCrF/NSQF Level: 4.5						
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	Industrial Automation integrates Mechanical, Electrical, Electronics and Automation Engineering. Candidates with Industrial Automation skills are highly required for the Recent Technological developments in Industries. The subjects covered in this program are – Electronics, Robotic Engineering, Computer-Aided Designing of Software, Modelling and Simulation of Mechatronics Systems, Sensors and Actuators, Mechanical Design, Circuits and Systems, Control Theory, Computer Programming, Microcontroller Programming and Power Engineering. Hands-on projects emphasize designing Mechanical Systems using Embedded Real-Time Computing including projects in Robotics, Automation and Controls.								
9.	Eligibility Criteria for Entry for Student/Trainee/Learner/Employee	Entry Qualification & Relevant Experience: <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Academic/Skill Qualification (with Specialization - if applicable)</th> <th>Required Experience (with Specialization)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Advanced Certificate – Assistant Technician Automation Level 4.0 from NTTF</td> <td>NA</td> </tr> </tbody> </table>			Sl. No.	Academic/Skill Qualification (with Specialization - if applicable)	Required Experience (with Specialization)	1	Advanced Certificate – Assistant Technician Automation Level 4.0 from NTTF	NA
Sl. No.	Academic/Skill Qualification (with Specialization - if applicable)	Required Experience (with Specialization)								
1	Advanced Certificate – Assistant Technician Automation Level 4.0 from NTTF	NA								
10.	Credits Assigned to this Qualification, Subject to Assessment (as per National Credit Framework (NCrF))	Total Credit – 43		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 <i>(Specify Total Duration as per selected training delivery modes and as per requirement of the qualification)</i>	☐ Offline ☐ Online ☒ Blended					
		Training Delivery Modes	Theory (Hours)	Practical (Hours)	OJT Mandatory (Hours)	OJT Recommended (Hours)	Total (Hours)
		Classroom (offline)	280	150	690	NIL	1120
		Online	170				170
(Refer Blended Learning Annexure for details)							
14.	Aligned to NCO/ISCO Code/s <i>(if no code is available mention the same)</i>	NCO Code – 2015.3114.0100, 2015.7311.0101, 2015.2141.0200, 2015.7412.0101					
15.	Progression path after attaining the qualification <i>(Please show Professional and Academic progression)</i>	Professional Progression: After Completion of Course and after 5 years of Industry Experience the Job Holder can work as a R&D Engineer, Servicing Engineer and Maintenance Engineer. Academic Progression: Post Diploma, B. VoC and B. Tech Degree Course in Relevant areas.					
16.	Other Indian languages in which the Qualification & Model Curricula 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 (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 <i>(In case of CS or MS, provide details of both Lead AB & Supporting ABs)</i>	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 – 5																
1	Automation in Manufacturing	CP36501T	Core	4.5	22	60	-	-	-	60	100	-	-	-	100	
2	Programmable Logic Controller	CP36502T	Core	4.5		45	-	-	-	45	100	-	-	-	100	
3	Electric Vehicle	CP36503T	Core	4.5		30	-	-	-	30	100	-	-	-	100	
4	Pneumatics and Hydraulics	CP36504T	Core	4.5		45	-	-	-	45	100	-	-	-	100	
5	Additive Manufacturing	CP36505T	Core	4.5		30	-	-	-	30	100	-	-	-	100	
6	Programmable Logic Controller Lab	CP36506P	Core	4.5		-	20	-	-	20	-	75	-	25	100	
7	Pneumatics and Hydraulics Lab	CP36507P	Core	4.5		-	20	-	-	20	-	75	-	25	100	
8	Additive Manufacturing	CP36508P	Core	4.5		-	20	-	-	20	-	75	-	25	100	
9	OJT	CP36509P	Core	4.5		-	-	360	-	360	-	75	-	25	100	
10	Employability Skills	CP36510T	Core	4.5		30	-	-	-	30	75	-	-	25	100	
Duration (in Hours)/ Total Marks					22	240	60	360		660	575	300	-	125	1000	
Semester – 6																
11	Introduction to Robotics	CP36601T	Core	4.5	21	45	-	-	-	45	100	-	-	-	100	
12	Introduction to IoT and Industry 4.0	CP36602T	Core	4.5		45	-	-	-	45	100	-	-	-	100	
13	Industrial and Production Management	CP36603T	Core	4.5		60	-	-	-	60	100	-	-	-	100	
14	Safety Health and Environment	CP36604T	Core	4.5		30	-	-	-	30	100	-	-	-	100	
15	Robotics Lab	CP36605P	Core	4.5		-	15	-	-	15	-	75	-	25	100	
16	IoT Lab	CP36606P	Core	4.5		-	15	-	-	15	-	75	-	25	100	
17	Project / Case Study	CP36607P	Core	4.5		-	60	-	-	60	-	75	-	25	100	
18	OJT	CP36608P	Core	4.5		-	-	330	-	330	-	75	-	25	100	
19	Employability Skills	CP36609T	Core	4.5		30	-	-	-	30	100	-	-	-	100	
Duration (in Hours)/ Total Marks					21	210	90	330	-	630	500	300	-	100	900	
Total for 3-year Programme					43	450	150	690	-	1290	1100	600	-	200	1900	

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/NS QF Level
Professional Theoretical Knowledge/Process	Identify Applications, applying appropriate information, tools and material, Integrate and Troubleshoot Mechanical, Electrical, Electronics and Computer Systems for Automation. Will have Capability to Organize and Perform by self and or work with Others to Implement, Troubleshoot Mechatronics System in Industries. Knowledge of Programming using PLC and associated software, Pneumatic, Electro-pneumatic, Hydraulic, Electro-Hydraulic controls and circuits. Knowledge on Additive Manufacturing Explain various types of Electric Vehicle Will have Capability to organize and perform by self and/or work with others in the above areas	Job Holder Understand Safety and Health aspects and Ensures Compliance with Health and Safety Regulations. Job Holder Can Design, Fabricate, Validate and Troubleshoot Mechatronics Systems. Job Holder can apply his/her Skill and Knowledge in the Operation of Automation Equipment. Will have Knowledge on Functions of Battery Management System of Electric Vehicle. Identify and explain the Automated Assembly processes in industry. Familiarization of basic elements of IoT.	4.5
Professional and Technical Skills/ Expertise/ Professional Knowledge	Specify and Use Electrical and Electronics Components and Equipment Explain the working of various robot applications in the industry. Develop, simulate and verify Mechanical, Electrical, Electronic, Pneumatic, Hydraulic circuit and systems. Ability to use PLC, Hydraulics and Pneumatics Equipment, to develop and control Automation Processes. Demonstrate Professional Knowledge on Additive Manufacturing	Trouble and maintain Electrical, Electronic Component/Equipment and their Appliances in the Industry. Will Have Knowledge in Applications of Computer Industrial application with Timer and Counter Will have Knowledge on Process Planning in an industry. Aware of systems and programs to control by integrating to automate industry	4.5

	Can analyze Data situations and take appropriate decisions. Can do continuous improvement in processes (KAIZEN)	processes.	
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	Able to communicate Effectively with Peers and Supervisors in the work area. Good Knowledge on Organization, ethical & moral values and Practice Time Management Able to Analyze solutions Critically and Logically for fine decision making. Able to work Effectively in a Team and lead a Team. Knowledge of the latest Technologies and Industrial Trends. Will have good Ingenuity and Creativity. Will have good Leadership Skills and have an entrepreneurial for small start-up.	Good Communication with Peers, superiors both verbal and written, Good on Presentation Skills, QC, 5S and KAIZEN. Can Analyze situations Critically and Logically. Adopt latest Technologies emerging in the Domain. Can lead a group to work Effectively. Can solve, adopt to new Situations Creatively.	4.5
Broad Learning Outcomes/Core Skill	Proficiency in using simulation software for validating system performance. Can use CAD software for making Mechanical and Electrical drawings. Can perform arithmetic and mathematic operations to evaluate system performance. Prepare Technical Reports and Presentations using MS Office Prepare emails for correspondence. Use Internet to get additional Technical Information Safety and standard operating Procedures and Practices in the work area.	Ability to create Technical Drawings. Ability to calculate required details for Mechatronic system performance evaluation and Inspection. Ability to make technical reports and Presentation using MS Office. Correspond through emails. Ability to retrieve necessary technical details from the Internet. Will follow all safety norms and standard operating Procedures in the work area.	4.5

	Communicate with Peers and Superiors. Critical Thinking, Creativity and Logical thinking. Data collection, analysis, decision making ability. Solve problems using QC tools and contribute for Kaizen in the work areas. Knowledge on effective 5S, TPM and TQM activities.	Verbal and written communication, computer literacy. Maintain Good Relationship with Peers and Superiors and Will be able to Win Good will and Trust of Peers. Analyze Critical problems in work area and real life. Decision Making ability. Process improvement and problem-solving skills.	
Responsibility	Aware of Personal/Industrial goals Adapt to changes in the work area. Thorough understanding of safety Procedures and SOPs in the relevant work area Supervise, evaluate and improve the activities of team in the work area.	Able to Carry out Design and Integration of Mechatronics Systems Under Minimum Supervision Guide Junior Technicians in Fulfilling Tasks Assigned to them.	4.5

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	77810164 51	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	77810164 51	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	77810164 51	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	77810164 51	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	77810164 51	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	77810164 51	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	77810164 51	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 – 5					
Automation in Manufacturing	Introduction to Automation – Advantages, disadvantages, application.	25	-	-	-
	Material Handling – Equipments, Application.	25	-	-	-
	Manual Assembly Line – Basic components.	25	-	-	-
	Automated Assembly System – Components and Functions.	25	-	-	-
	Total Marks	100			
Programmable Logic Controller	PLC Basics – Function, specification, application.	15	-	-	-
	Basic Programming of PLC	25	-	-	-
	PLC basic function	15	-	-	-
	Intermediate function	15	-	-	-
	Data handling function	15	-	-	-
	Application of PLC – Interfacing working elements	15	-	-	-
	Total Marks	100			
Electric Vehicle	Introduction – Parts, function, technology adopted.	10	-	-	-
	Battery Pack – Types, specifications, application.	10	-	-	-
	Battery Management System – Hardware, software.	15	-	-	-
	Power Convertor - Types, specifications, application.	10	-	-	-
	Traction Motor - Types, specifications, application.	10	-	-	-
	Power Distribution Unit – Hardware, software.	10	-	-	-

	Mechanical Elements in EV	15	-	-	-
	Charging Station – Types, advantages.	10	-	-	-
	Electric Vehicle Manufacturing – Brief introduction to EV manufacturing.	10	-	-	-
	Total Marks	100			
Pneumatics and Hydraulics	Pneumatic Power and Hydraulic Power – Advantages, disadvantages, application.	10	-	-	-
	Compressed Air – Types of compressors, terms used.	10	-	-	-
	Pneumatic Working Elements – Types, specifications and applications of cylinders and valves.	20	-	-	-
	Pneumatic Circuits – Design of pneumatic circuits.	20	-	-	-
	Hydraulics Working Elements - Types, specifications and applications of cylinders and valves.	20	-	-	-
	Hydraulics Circuits – Design of Hydraulic circuit.	20	-	-	-
	Total Marks	100			
Additive Manufacturing	Introduction to AM Technologies	20	-	-	-
	AM Technologies and Materials	20	-	-	-
	CAD for AM	20	-	-	-
	Post Processing	20	-	-	-
	Applications of AM	20	-	-	-
	Total Marks	100			
Employability Skills	Essential Skills for Success	20	-	-	5
	Quality Management	15	-	-	10
	Critical thinking and Problem solving	20	-	-	5
	Getting ready for Entrepreneurship	20	-	-	5
	Total Marks	100			

Programmable Logic Controller Lab	Familiarisation of PLC System	-	15	-	5
	Familiarisation of Basics Function	-	20	-	5
	Basic Logic Function	-	20	-	5
	Basics of Timer and Counter	-	20	-	10
	Total Marks	100			
Pneumatics and Hydraulics Lab	Familiarization of Compressor and its parts Air driers FRL unit Single acting and double acting cylinder Direction control valve Flow control valve Pressure control valve	-	15	-	5
	Stimulation of basic Pneumatic circuits	-	15	-	5
	Rigging of basic Pneumatic circuits	-	10	-	5
	Familiarization of Hydraulic Power pack Single acting and double acting cylinder Direction control valve Flow control valve Pressure control valve	-	10	-	5
	Stimulation of basic Hydraulic circuits	-	15	-	5
	Rigging of basic Hydraulic circuits	-	10	-	-
	Total Marks	100			
Additive Manufacturing Lab	3D Printing Machine Fundamentals	-	15	-	5
	3D Modelling using CAD Software	-	15	-	
	3D Printing Software	-	15	-	
	Part Printing	-	15	-	10
	Post Processing	-	15	-	10
	Total Marks	100			

OJT	On the Job Training in the relevant sector	-	75	-	25
	Total Marks	100			
Semester – 6					
Introduction to Robotics	Introduction to Robotics – Application in industry, Advantages	10	-	-	-
	Robot motion	15	-	-	-
	End effectors	20	-	-	-
	Machine Vision	15	-	-	-
	Robotic Language and Programming	25	-	-	-
	Robot Application	15	-	-	-
	Total Marks	100			
Introduction to IoT and Industry 4.0	Introduction to Industry 4.0	15	-	-	-
	Building Blocks of Industry 4.0	20	-	-	-
	Internet of Things (IOT) – Application in Industry with Case Studies	40	-	-	-
	Future Trends in Industry 4.0 and IOT	25	-	-	-
	Total Marks	100			
Industrial and Production Management	Selection of Plant Location / Site	10	-	-	-
	Plant Layout – Large plants	10	-	-	-
	Production Methods	05	-	-	-
	Types of organization	05	-	-	-
	Leader ship – Styles of Leadership	05	-	-	-
	Motivation – Motivational Theories	10	-	-	-
	Industrial Acts	05	-	-	-
	Types of Manufacturing Industry	05	-	-	-
	Layout for Production in workshop	05	-	-	-

	Production Planning and Control	10	-	-	-
	Material, Purchase, Store, and Inventory Management	10	-	-	-
	TPM	20	-	-	-
	Total Marks	100			
Safety Health and Environment	Safety	25	-	-	-
	Health	25	-	-	-
	Environment	25	-	-	-
	Introduction to ISO 14001 and OHSAS 18001	25	-	-	-
	Total Marks	100			
Employability Skills	Labour Welfare and Legislation.	20	-	-	5
	Customer Interaction/ Service.	15	-	-	10
	Conflict resolution and Negotiation	20	-	-	5
	Job readiness and Exam Preparation	20	-	-	5
	Total Marks	100			
Robotics Lab	Pick and Place	-	15	-	10
	Sorting	-	20	-	5
	Welding	-	20	-	5
	Painting	-	20	-	5
	Total Marks	100			
IoT Lab	Familiarization on Basic elements of IoT	-	35	-	10
	Evaluation of Observation Format	-	40	-	15
	Total Marks	100			
Project / Case Study	Project / Case Study A group of (3 to 4) students shall do Project / Case Study in their work area under the guidance of faculty and an executive from the work area. The Project / Case Study to bring out the application of learning's across semesters.	-	-	-	-
	Project / Case Study Execution - Steps for Project / Case Study Execution Scope Data collection Analysis of data	-	25	-	5

	Cause identification Development of solutions Evaluation of solutions & selection of best solution Implementation of solution Evaluation of results Standardization & Documentation of solution				
	Project / Case Study Report – Project / Case Study Report structured as under Selection of the Project / Case Study Data collection & Analysis Development of solution, trials & implementation Standardization Benefits of the Project / Case Study Presentation	--	25	-	15
	Project / Case Study Evaluation – Project / Case Study Evaluated on the following Results achieved Application of learning & knowledge acquired Quality of presentation - Data, visuals	-	25	-	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:

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

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

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.nttftg.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 White 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 – 5		Module Name: Automation in Manufacturing	Module Code: CP36501T
Sl. No.	Module Details		Theory Hours 60
1	Introduction to Automation		12h
2	Material Handling		16h
3	Manual Assembly Line		16h
4	Automated Assembly System		16h
	Total Hours		60h

Semester – 5		Module Name: Programmable Logic Controller	Module Code: CP36502T
Sl. No.	Module Details		Theory Hours 45
1	PLC Basics		3h
2	Basic Programming		10h
3	PLC Basic Function		8h
4	Intermediate Function		8h
5	Data Handling Function		8h
6	Application		8h
	Total Hours		45h

Semester – 5		Module Name: Electric Vehicle	Module Code: CP36503T
Sl. No.	Module Details		Theory Hours 30
1	Introduction		3h
2	Battery Pack		3h
3	Battery Management System		4h
4	Power Convertor		4h
5	Traction Motor		3h
6	Power Distribution Unit		3h
7	Mechanical Elements in EV		4h
8	Charging Station		3h
9	Electric Vehicle Manufacturing		3h
	Total Hours		30h

Semester – 5		Module Name: Pneumatics and Hydraulics	Module Code: CP36504T
Sl. No.	Module Details		Theory Hours 45
1	Pneumatic Power and Hydraulic Power		6h

2	Compressed Air	5h
3	Pneumatic Working Elements	8h
4	Pneumatic Circuits	9h
5	Hydraulics Working Elements	8h
6	Hydraulics Circuits	9h
	Total Hours	45h

Semester – 5 Module Name: Additive Manufacturing Module Code: CP36505T		
Sl. No.	Module Details	Theory Hours 30
1	Introduction to AM Technologies	4h
2	AM Technologies and Materials	6h
3	CAD for AM	8h
4	Post Processing	4h
5	Applications of AM	8h
	Total Hours	30h

Semester – 5 Module Name: Programmable Logic Controller Lab Module Code: CP36506P		
Sl. No.	Module Details	Practical Hours 20
1	Familiarisation of PLC System	4h
2	Familiarisation of Basics Function	5h
3	Basic Logic Function	5h
4	Basics of Timer and Counter	6h
	Total Hours	20h

Semester – 5 Module Name: Pneumatics and Hydraulics Lab Module Code: CP36507P		
Sl. No.	Module Details	Practical Hours 20
1	Familiarization of Compressor and its parts Air driers FRL unit Single acting and double acting cylinder Direction control valve Flow control valve Pressure control valve	3h

2	Stimulation of basic Pneumatic circuits	3h
3	Rigging of basic Pneumatic circuits	4h
4	Familiarization of Hydraulic Power pack Single acting and double acting cylinder Direction control valve Flow control valve Pressure control valve	4h
5	Stimulation of basic Hydraulic circuits	3h
6	Rigging of basic Hydraulic circuits	3h
Total Hours		20h

Semester – 5		Module Name: Additive Manufacturing Lab	Module Code: CP36508P
Sl. No.	Module Details	Practical Hours 20	
1	3D Printing Machine Fundamentals	4h	
2	3D Modelling using CAD Software	4h	
3	3D Printing Software	4h	
4	Part Printing	4h	
5	Post Processing	4h	
Total Hours		20h	

Semester – 5		Module Name: OJT	Module Code: CP36509P
Sl. No.	Module Details	Practical Hours 360	
1	On the Job Training in the relevant sector	360h	
Total Hours		360h	

Semester – 5		Module Name: Employability Skills	Module Code: CP36510T
Sl. No.	Module Details	Theory Hours 30	
1	Essential Skills for Success	6h	
2	Quality Management	9h	
3	Critical thinking and Problem solving	8h	
4	Getting ready for Entrepreneurship	7h	
Total Hours		30h	

Semester – 6 Module Name: Introduction to Robotics Module Code: CP36601T		
Sl. No.	Module Details	Theory Hours 45
1	Introduction to Robotics	3h
2	Robot motion	6h
3	End effectors	6h
4	Machine Vision	10h
5	Robotic Language and Programming	12h
6	Robot Application	8h
	Total Hours	45h
Semester – 6 Module Name: Introduction to IoT and Industry 4.0 Module Code: CP36602T		
Sl. No.	Module Details	Theory Hours 45
1	Introduction to Industry 4.0	5h
2	Building Blocks of Industry 4.0	8h
3	Internet of Things (IOT)	20h
4	Future Trends in Industry 4.0 and IOT	12h
	Total Hours	45h
Semester – 6 Module Name: Industrial and Production Management Module Code: CP36603T		
Sl. No.	Module Details	Theory Hours 60
1	Selection of Plant Location / Site	4h
2	Plant Layout	4h
3	Production Methods	4h
4	Types of organization	4h
5	Leader ship	4h
6	Motivation	4h

7	Industrial Acts	4h
8	Types of Manufacturing Industry	5h
9	Layout	5h
10	Production Planning and Control	8h
11	Material, Purchase, Store, and Inventory Management	8h
12	TPM	6h
	Total Hours	60h

Semester – 6 Module Name: Safety Health and Environment Module Code: CP36604T		
Sl. No.	Module Details	Theory Hours 30
1	Safety	5h
2	Health	5h
3	Environment	10h
4	Introduction to ISO 14001 and OHSAS 18001	10h
	Total Hours	30h

Semester – 6 Module Name: Robotics Lab Module Code: CP36605P		
Sl. No.	Module Details	Practical Hours 15
	Simulation / Observation at plant	
1	Pick and Place	3h
2	Sorting	4h
3	Welding	4h
4	Painting	4h
	Total Hours	15h

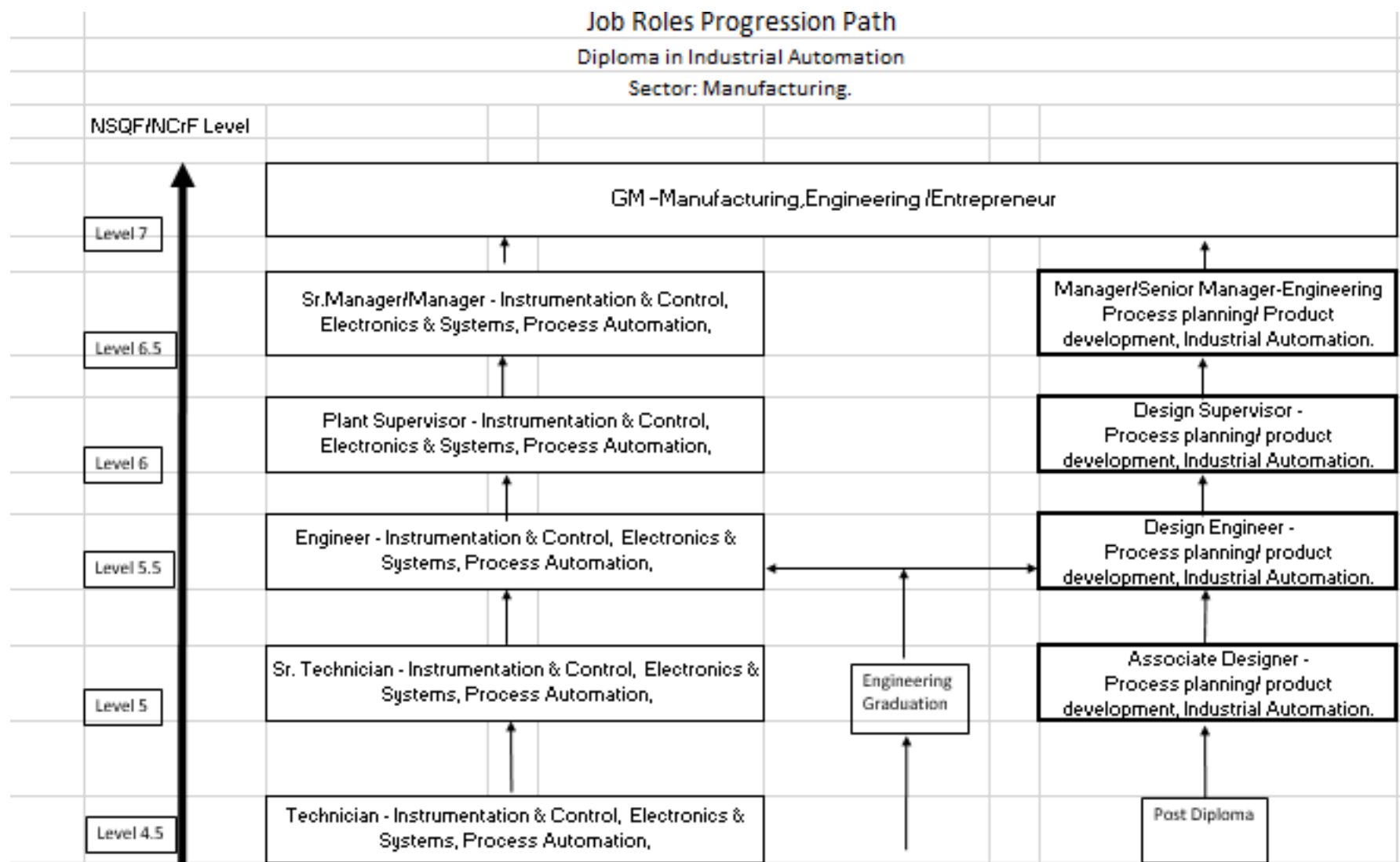
Semester – 6 Module Name: IoT Lab Module Code: CP36606P		
Sl. No.	Module Details	Practical Hours 15
1	Familiarization on Basic elements of IoT	6h
2	Observation / Implementation of IoT in the plant	9h
	Total Hours	15h

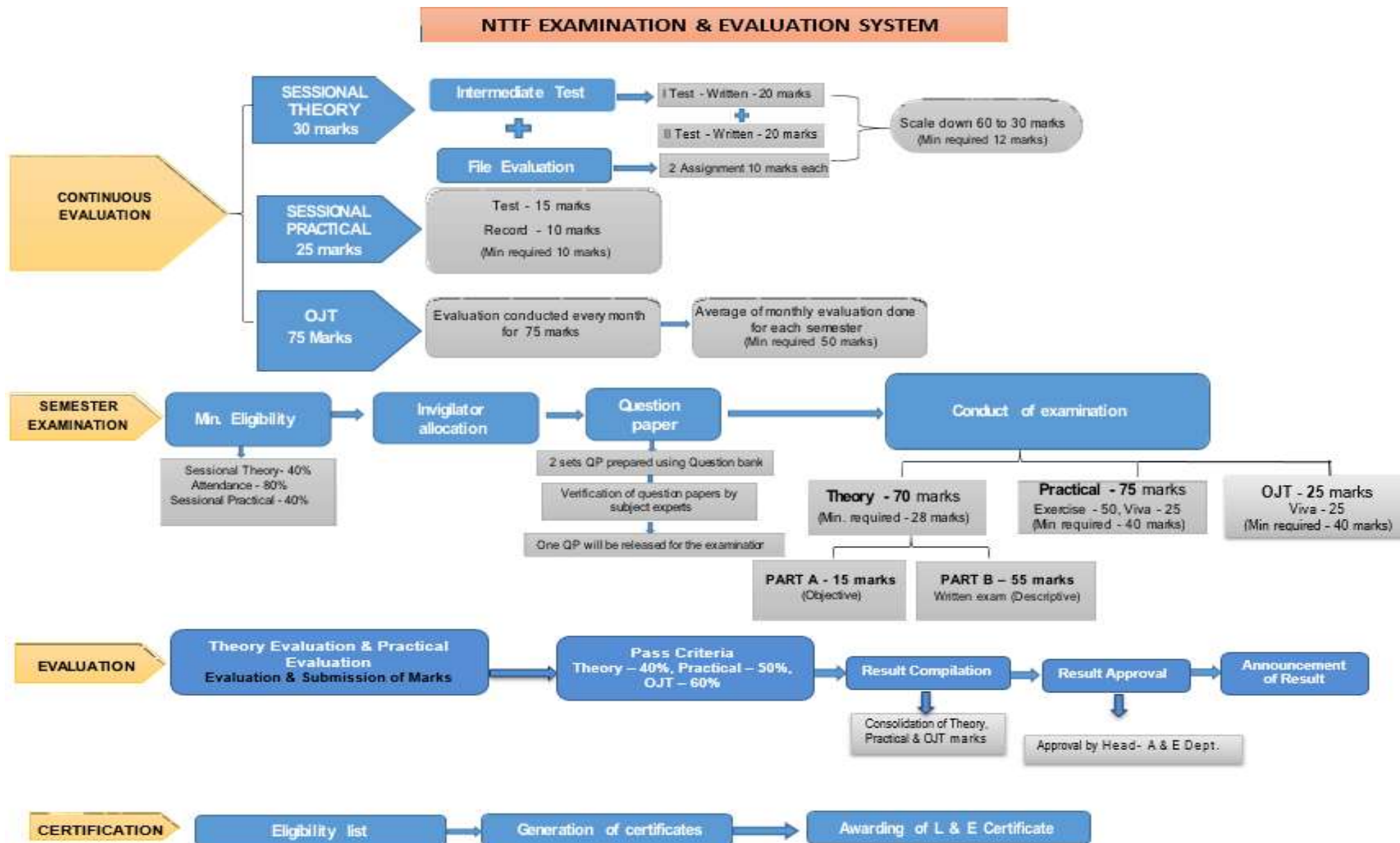
Semester – 6		Module Name: Project / Case Study	Module Code: CP36607P
Sl. No.	Module Details		Practical Hours 60
1	Project / Case Study A group of (3 to 4) students shall do Project / Case Study in their work area under the guidance of faculty and an executive from the work area. The Project / Case Study to bring out the application of learning's across semesters.		
2	Project / Case Study Execution - Steps for Project / Case Study Execution Scope Data collection Analysis of data Cause identification Development of solutions Evaluation of solutions & selection of best solution Implementation of solution Evaluation of results Standardization & Documentation of solution		
3	Project / Case Study Report – Project / Case Study Report structured as under Selection of the Project / Case Study Data collection & Analysis Development of solution, trials & implementation Standardization Benefits of the Project / Case Study Presentation		
4	Project / Case Study Evaluation – Project / Case Study Evaluated on the following Results achieved Application of learning & knowledge acquired Quality of presentation - Data, visuals		
	Total Hours		60h

Semester – 6		Module Name: OJT	Module Code: CP36608P
Sl. No.	Module Details		Practical Hours 330
1	On the Job Training in the relevant sector		330h
	Total Hours		330h

Semester - 6	Module Name: Employability Skills	Module Code: CP36609T
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Sl. No.	Module Details	Theory Hours 30
1	Labour Welfare and Legislation.	6h
2	Customer Interaction/ Service.	9h
3	Conflict resolution and Negotiation	9h
4	Job readiness and Exam Preparation	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 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 5. Responsibility: Business Management (like GM/ CEO / CXO ,etc.)	1321	GM - Manufacturing	GM - Engineering/ Entrepreneur
Level 6.5	1. Professional Theoretical Knowledge: Advanced multidisciplinary and specialized knowledge 2. 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 5. Responsibility: Vertical/ Business unit management –Manager or Senior Manager	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.

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	1. Professional Theoretical Knowledge: Range of knowledge 2. Professional and Technical Skills/ Expertise: Range of technical skills 3. Employment Readiness &	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		Study Post Diploma

	Entrepreneurship Skills & Mind-set: Team readiness & Entrepreneurial 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 - Jr. technician/Assistant	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
3rd Year				
1	Automation in Manufacturing (CP36501T) Awareness on Automation in manufacturing process.	Understand automation in industry – manufacturing process.	Knowledge on material handling. Understand and distinguish between manual and Automated Assembly lines.	Identify and explain the assembly processes in industry.
2	Programmable Logic Controller (CP36502T) Programmable Logic Controller Lab (CP36506P) Simple programs using PLC to interface timers and counters.	Knowledge and understanding of basic PLC. Basic Logic Function Basics of Timer and Counter	Write simple ladder diagrams for controlling input output components. Intermediate and data handling functions. Interfacing Timers and counters.	Write programs for small simple logic circuits for industrial applications and trouble shoot control circuits. Industrial application with Timer and Counter
3	Electric Vehicle (CP36503T) Knowledge of Electric Vehicle	Electric Vehicle Types, Advantages and Disadvantages of Electric Vehicles	State types and Specification and applications of Battery. Functions of Battery Management System	Knowledge of Electric Vehicle Charging Station - Specification and Application

4	Pneumatics and Hydraulics (CP36504T) Pneumatics and Hydraulics Lab (CP36507P) Ability to rig up simple Pneumatic and Hydraulic circuits	Differentiate between pneumatic and hydraulic power. State application, advantages, and disadvantages of Hydraulics State Properties of Fluid State Characteristics of Compressed air, preparation of Distribution of Compressed air.	Selection and applications of Pneumatic actuators and Pneumatic valves. State types and Specification and applications of Hydraulic Oils, Hydraulic Hoses, hydraulic Filters. Pneumatic Working Elements Hydraulics Working Elements	Design, implement to control different valves, troubleshoot Pneumatic and Hydraulic Circuits. Stimulation of basic Pneumatic circuits and Hydraulic circuits. Rigging of basic Pneumatic circuits Rigging of basic Hydraulic circuits
5	Additive Manufacturing (CP36505T) Additive Manufacturing Lab (CP36508P) Understand Additive manufacturing Technology, and the materials used and their Properties.	Understand Difference, Advantages and Applications of Additive Manufacturing over Conventional Manufacturing Convert CAD File for AM Describe the process of Material Extrusion - FDM and Material Jetting - Polyjet Describe the Post Processing Tools and Procedure	Additive manufacturing Technology, and the materials used and their Properties. Specify the Materials and relevant Properties used for Additive Manufacturing Technologies - Material Extrusion and Material Jetting 3D Printing Machine Fundamentals	Select appropriate 3D printing process
6	Introduction to Robotics (CP36601T) Robotics Lab (CP36605P) Understand robot applications	Understanding types of Robots, knowledge on Robot Anatomy, Degree of Freedom, Understanding Robot motion analysis, Robot communication Methods.	Collect relevant information to Programme robot via teach box, software. Explain the working of various robot applications in the industry.	Programme robot via teach box, software. Test functionality

7	Introduction to IoT and Industry 4.0 (CP36602T) IoT Lab (CP36606P) Awareness if Industry 4.0 and IoT.	Understand Industrial revolution 1.0 onwards. IoT and Future trends.	Architecture/ Building blocks of I-4.0. Familiarization of basic elements of IoT.	Components of I-4.0 and applications of IoT. Implementation of IoT.
8	Industrial and Production Management (CP36603T) Awareness on Organization, leadership, motivation, Industrial acts. Awareness of various activities associated with industry – layout, production planning, Inventory etc.	Understand various industrial acts for the welfare of employees in an organization. Describe types of Organisations Knowledge on types of Industry	Describe factors influencing selection of Site. Explain advantages and disadvantages of Process Layout, Product Layout and Fixed Position Layout. Explain Mass Production, Batch Production and Job Order Production. Explain the layout, production planning and control	Leadership Styles and Qualities of Good Leader. Theories of Motivation, awareness of industrial acts. Plan, manage material inventory and purchase process. Clarity on Total productivity Management.
9	Safety Health and Environment (CP36604T) Awareness on Environmental safety, Health, ISO and OHSAS	Understand Health Hazards and Controlling Methods. Explain various pollution, (Air, Water, and Noise and Controlling Methods). Knowledge on ISO 14001 and OHSAS 18001.	Understand the need of recording and investigating Accidents. Explain Energy Saving Methods. Explain methods of disposal of wastes. Explain contribution of wind and solar energy to environment.	Practice personal, shop floor, Electrical and Fire Safety. Use Appropriate PPE, Help in Preventing and Controlling Accidents.

10	Project / Case Study (CP36607P)			Case study under the work area under the guidance of faculty or executive in the work area
11	OJT (CP36509P) OJT (CP36608P)			On the Job Training in the relevant sector
12	Employability Skills (CP36510T) (CP36609T) Understand Labour Welfare and Legislation. Understand the concept of Quality Management Getting ready for Employment/ Entrepreneurship Learn to interact with customers/ provide service.	Knowledge on benefits guaranteed under various Acts, legislations, Factories act, Apprenticeship Act, ESI, EPF Acts, Payment of wages act, women's compensation Act, POSH, and other industrial laws. Understanding of Quality concepts, QMS, PDCA QC Tools, 5S, Kaizen. ISO Process. Distinguishing between Job and Career, Awareness of different job roles in the related sector. Understanding the pathway and progression. Creating resume and apply for Jobs.	Explain various Acts enacted for labour welfare by various Governments. Attend mock interviews, create Resume documents. Body language, relationship building, probing techniques.	Use of various QC tools and Kaizen for problem solving and Quality improvement themes. Customer handling from greeting, grievance handling.

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