QUALIFICATION FILE

Advanced Mechatronics Engineer

☒ 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: 5.5

Submitted By:

Capital Goods and Strategic Skill Council

39,1st Floor, Samyak Tower, Pusa Rd, Block 9A, WEA, Karol Bagh, New Delhi, Delhi, 110005

Table of Contents

Section 1: Basic Details

<table>
<tr><td>1.</td><td>Qualification Name</td><td colspan="2">Advanced mechatronics engineer</td></tr>
<tr><td>2.</td><td>Sector/s</td><td colspan="2">Capital Goods and Strategic Manufacturing</td></tr>
<tr><td>3.</td><td>Type of Qualification: ☒ New ☐ Revised ☐ Has Electives/Options ☐OEM</td><td>NQR Code & version of existing/previous qualification: (change to previous, once approved)
QG-5.5-CG-02047-2024-V1-CGSC</td><td>Qualification Name of existing/previous version:</td></tr>
<tr><td>4.</td><td>a. OEM Name
b. Qualification Name
(Wherever applicable)</td><td colspan="2"></td></tr>
<tr><td>5.</td><td>National Qualification Register (NQR) Code &Version
(Will be issued after NSQC approval)</td><td>QG-5.5-CG-02047-2024-V1-CGSC</td><td>6. NCrF/NSQF Level: 5.5</td></tr>
<tr><td>7.</td><td>Award (Certificate/Diploma/Advance Diploma/ Any Other (Wherever applicable specify multiple entry/exits also & provide details in annexure)</td><td colspan="2">Certificate</td></tr>
<tr><td>8.</td><td>Brief Description of the Qualification</td><td colspan="2">An Advanced Mechatronics Engineer is a professional responsible for designing, developing, and implementing advanced mechatronic systems and solutions within the capital goods industry. Capital goods refer to long-term assets used in the production of goods and services, including machinery, equipment, and technology.</td></tr>
<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>S. No.</th><th>Academic/Skill Qualification (with Specialization - if applicable)</th><th>Required Experience (with Specialization - if applicable)</th></tr>
<tr><td>1.</td><td>UG Degree in relevant field</td><td>2 years of relevant experience</td></tr>
<tr><td>2.</td><td>3 Years UG Degree in Science and Technology (B.Sc / BCA) / 4 years BE, B.Tech (Electrical, Electronics, Mechanical, Mechatronics, Instrumentation and Control)</td><td></td></tr>
<tr><td>3.</td><td>10th grade pass +3 years Diploma in relevant field</td><td>5 year of relevant experience</td></tr>
<tr><td>4.</td><td>Previous NSQC level 5</td><td>1.5 years of relevant experience</td></tr>
</table></td></tr>
</table>

				*Subject to being offered as 6 months internship/ project

b. **Age:** 24

10	**Credits Assigned to this Qualification, Subject to Assessment** *(as per National Credit Framework (NCrF))*	19	**11. Common Cost Norm Category (I/II/III)** *(wherever applicable)*: **I**
12	**Any Licensing requirements for Undertaking Training on This Qualification** *(wherever applicable)*	NA	
13	**Training Duration by Modes of Training Delivery** *(Specify **Total Duration** as per selected training delivery modes and as per requirement of the qualification)*	**☐Offline ☐Online ☒Blended**	
14	**Aligned to NCO/ISCO Code/s** *(if no code is available mention the same)*	**2144.9900**	
15	**Progression path after attaining the qualification** *(Please show Professional and Academic progression)*	Sr. Engineer/ Simulationist, Project Manager Mechatronics	
16	**Other Indian languages in which the Qualification & Model Curriculum are being submitted**	**No**	
17	**Is similar Qualification(s) available on NQR-if yes, justification for this qualification**	**☐ Yes ☒ No URLs of similar Qualifications:**	
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**	**The qualification pack empowers women to participate and thereby creating employment and research openings in different sectors**	
20	**Are Greening/ Environment Sustainability Aspects Covered** *(Specify the NOS/Module which covers it)*	**☐ Yes ☒ No**	

Training Delivery Modes	Theory (Hours)	Practical (Hours)	OJT Mandatory (Hours)	OJT Recommended (Hours)	Total (Hours)
Classroom (offline)	90	300	90		570
Online	90				

(Refer Blended Learning Annexure for details)

21	**Is Qualification Suitable to be Offered in Schools/Colleges**	**Schools ☒ Yes ☐ No Colleges ☒ Yes ☐ No** **School: Atal Tinkering labs** **College: Atal Incubation, MSME incubation and state incubators**	
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: Ms. Shalini Singh** **Email: ceo@cgssc.org** **Contact No.: 9654310244** **Website: www.cgsc.in**	
23	**Final Approval Date by NSQC: 31st January 2024**	**24. Validity Duration: 3 years**	**25. Next Review Date:30 January 2027**

Section 2: Module Summary

NOS/s of Qualifications

(In exceptional cases these could be described as components)

Mandatory NOS/s:

Specify the training duration and assessment criteria at NOS/ Module level. For further details refer curriculum document.

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

S. 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.	Configure and install electronic components in the mechatronic systems	CSC/N0507 v1.0	Core	5.5	5	45	75	30	-	150	30	55	-	15	100	20.62
2.	Aligning and testing electronic sensors and actuators in the mechatronics system	CSC/N0508 V1.0	Core	5.5	4	35	55	30	-	120	30	55	-	15	100	20.62
3.	Configure and test the microcontroller in the mechatronics system	CSC/N0424 V1.0	Core	5.5	4	35	55	30	-	120	30	55	-	15	100	20.62
4.	Collaboratively coordinate with the team	CSC/N1339 V1.0	Non-core	5	3	35	55	-	-	90	30	70	-	-	100	20.62
5.	Follow health, safety and environment guidelines at workplace	CSC/N0505 V1.0	Non-core	5	1	10	20	-	-	30	15	20	-	-	35	7.22

S. 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)*
6.	Employability Skills (60 Hours)	DGT/VSQ/N0102 V1.0	Non-Core	4	2	20	40	-	-	60	20	30	-	-	50	10.30
Duration (in Hours) / Total Marks					19	180	300	90	-	570	155	285		45	485	100

Assessment - Minimum Qualifying Percentage

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

Minimum Pass Percentage – Aggregate at qualification level: 70 % *(Every Trainee should score specified minimum aggregate passing percentage at qualification level to successfully clear the assessment.)*

Minimum Pass Percentage – NOS/Module-wise: 70 % *(Every Trainee should score specified minimum passing percentage in each mandatory and selected elective NOS/Module to successfully clear the assessment.)*

Section 3: Training Related

1.	**Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	B. Tech in Mechanical/ Electronics/ Mechatronics with 7 years of relevant experience.
2.	**Master Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	B. Tech in Mechanical/ Electronics/ Mechatronics with 10 years of relevant 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**	

Section 4: Assessment Related

	Assessor's Qualification and experience in relevant sector (in years) *(as per NCVET guidelines)*	B. Tech in Mechanical/ Electronics/ Mechatronics with 7 years of relevant experience.

	Proctor's Qualification and experience in relevant sector (in years) *(as per NCVET guidelines)*	B. Tech in Mechanical/ Electronics/ Mechatronics with 7 years of relevant experience.
	Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years) *(as per NCVET guidelines)*	B. Tech in Mechanical/ Electronics/ Mechatronics with 10 years of relevant experience.
	Assessment Mode *(Specify the assessment mode)*	Offline
	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.	**Latest Skill Gap Study (not older than 2 years) (Yes/No):** No
2.	**Latest Market Research Reports or any other source (not older than 2 years) (Yes/No):** Yes
3.	**Government /Industry initiatives/ requirement (Yes/No):** Yes
4.	**Number of Industry validation provided:** 6
5.	**Estimated nos. of persons to be trained and employed:** 821
6.	**Evidence of Concurrence/Consultation with Line Ministry/State Departments:** We have received the work order from ministry If "No", why:

Section 6: Annexure & Supporting Documents Check List

Specify Annexure Name / Supporting document file name

1.	**Annexure:** NCrF/NSQF level justification based on NCrF level/NSQF descriptors *(Mandatory)*	*Annexure: Evidence of Level*
2.	**Annexure:** List of tools and equipment relevant for qualification *(Mandatory, except in case of online course)*	*Annexure: Tools and Equipment (Lab Set-Up)*
3.	**Annexure:** Detailed Assessment Criteria *(Mandatory)*	*Annexure: Detailed Assessment Criteria*
4.	**Annexure:** Assessment Strategy *(Mandatory)*	*Annexure: Assessment Strategy*
5.	**Annexure:** Blended Learning *(Mandatory, in case selected Mode of delivery is "Blended Learning")*	
6.	**Annexure:** Multiple Entry-Exit Details *(Mandatory, in case qualification has multiple Entry-Exit)*	

7.	**Annexure:** Acronym and Glossary *(Optional)*	*Annexure: Acronym and Glossary*
8.	**Supporting Document:** Model Curriculum *(Mandatory – Public view)*	*MC_CG Advanced Mechatronics engineer*
9.	**Supporting Document:** Career Progression *(Mandatory - Public view)*	
10.	**Supporting Document:** Occupational Map *(Mandatory)*	*Occupational Mapping*
11.	**Supporting Document:** Assessment SOP *(Mandatory)*	*Attached in MC_CG Advanced Mechatronics Engineer*
12.	**Any other document you wish to submit:**	

Annexure: 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	• Configure, install electronic components in the mechatronics systems • Align, test electronic sensors and actuators in the mechatronics system • Configure and test the microcontroller in the mechatronics system • Collaboratively work with different stake holders at the workplace • Implement hygiene health and safety practices at the workplace • Employability Skills	As can be inferred from the learning outcomes and performance criteria of the Qualification listed in the adjacent cell, the Advanced mechatronics engineer requires well developed skill, with clear choice of procedures in familiar context. Hence NSQF level for this descriptor is 5.5.	5.5
Professional and Technical Skills/ Expertise/ Professional Knowledge	• In-depth understanding of mechatronics principles, integrating mechanical, electrical, and computer	As can be inferred from the knowledge and understanding related points mentioned in the adjacent cell, which have been taken from the Advanced mechatronics engineer qualification	5.5

	engineering for advanced control systems. • Proficiency in designing and implementing advanced control algorithms for mechatronic systems, ensuring precision and reliability. • Expertise in developing robotic systems, including kinematics, dynamics, and programming for efficient and accurate robotic operations. • Knowledge of a wide range of sensors and actuators, and the ability to seamlessly integrate them into mechatronic systems for optimal functionality. • Proficient in programming languages such as C++, Python, or Java for developing control software and implementing algorithms. • Experience in programmable logic controllers (PLCs) and automation systems, with the ability to design, program, and optimize automated processes.	pack, job role holder must have a knowledge of facts, principles, processes and general concepts, in a field of work or study Hence NSQF level for this descriptor is 5.5.	

	• Skill in using modeling and simulation tools (such as MATLAB/Simulink) to analyze and optimize the performance of mechatronic systems. • Expertise in developing and programming embedded systems, ensuring seamless communication and control within mechatronic devices. • Proficient in integrating electrical and electronic components into mechatronic systems, ensuring compatibility and reliability. • Knowledge of machine vision systems and image processing techniques for applications like object recognition, tracking, and quality control. • Familiarity with various communication protocols (e.g., CAN, Modbus, Ethernet) to establish efficient communication between different components within a mechatronic system. • Strong analytical skills to identify and resolve complex issues in mechatronic systems,		

	ensuring optimal performance and reliability. • Ability to manage and lead mechatronics projects, including planning, resource allocation, and ensuring timely completion. • Proficiency in developing testing protocols and conducting thorough quality assurance tests to validate the functionality and performance of mechatronic systems. • Commitment to staying updated on the latest advancements in mechatronics, automation, and related fields, with a focus on continuous learning and adaptation to emerging technologies.		
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	• Technical Proficiency. • Communication Skills. • Continuous Learning Mindset. • Adaptability and Flexibility. • Entrepreneurial Spirit. • Attention to Detail. • Ethical Conduct. • Customer-Centric Approach. • Risk Management.	As can be inferred from the knowledge and understanding related points mentioned in the adjacent cell, which have been taken from Advanced mechatronics engineer qualification pack, job role holder must have a knowledge of facts, principles, processes and general concepts, in a field of work or study Hence NSQF level for this descriptor	5.5

	• Leadership Skills. • Networking and Relationship Building. • Time Management. • Result-Driven Attitude.	is 5.5.	
Broad Learning Outcomes/Core Skill	• Communication Skills • Decision Making • Planning • Mathematical Skills • Digital skills	As can be inferred from the knowledge and understanding related points mentioned in the adjacent cell, which have been taken from the Advanced mechatronics engineer qualification pack, job role holder must have a knowledge of facts, principles, processes, and general concepts, in a field of work or study.	5.5
Responsibility	• Configure, install electronic components in the mechatronics systems • Align, test electronic sensors and actuators in the mechatronics system • Configure and test the microcontroller in the mechatronics system • Collaboratively work with different stake holders at the workplace • Implement hygiene health and safety practices at the workplace • Employability Skills	As can be inferred from the knowledge and understanding related points mentioned in the adjacent cell, the Advanced mechatronics engineer must take responsibility for own work and learning and some responsibility for others' works and learning. Hence NSQF level for this descriptor is 5.5.	5.5

Annexure: Tools and Equipment (Lab Set-Up)

List of Tools and Equipment
Batch Size: 30

S. No.	Tool / Equipment Name	Specification	Quantity for specified Batch size

1.	Computer and Software	High-performance computer with sufficient processing power and memory. CAD software (e.g., SolidWorks, AutoCAD) for designing mechanical components. Simulation and modelling software (e.g., MATLAB/Simulink) for system analysis. Programming tools (e.g., IDEs for C++, Python) for software development.	20
2.	Control Hardware	Programmable Logic Controllers (PLCs) for automation and control. Microcontrollers and embedded systems for device control. Motor controllers and drivers for precise motion control.	20
3.	Sensors and Actuators	Various sensors (e.g., proximity sensors, accelerometers, encoders) for feedback. Actuators (e.g., servos, motors, pneumatics) for mechanical movement.	20
4.	Robotics Components	Robot arms and manipulators for robotic applications. Grippers, end effectors, and tool changers for specific tasks. Vision systems for machine vision applications.	20
5.	Communication Devices	Communication modules and protocols (e.g., Ethernet, CAN, Modbus) for device connectivity. Data acquisition systems for collecting and analyzing data.	20
6.	Test and Measurement Equipment	Oscilloscopes, multimeters, and signal generators for electrical measurements. Force/torque sensors and load cells for mechanical testing. Thermal imaging cameras for temperature monitoring.	20
7.	Power Supplies	Variable power supplies for testing and powering electronic components. Battery management systems for portable applications.	20
8.	Networking Equipment	Routers, switches, and other networking devices for communication between systems.	20
9.	Machine Shop Tools	CNC machines for prototyping and manufacturing mechanical components. 3D printers for rapid prototyping.	15 each
10.	Safety Equipment	Personal protective equipment (PPE) including safety glasses, gloves, and ear protection. Safety barriers and guards for working with automated systems.	30 each
11.	Diagnostic and Calibration Tools	Diagnostic tools for troubleshooting and identifying issues.	20 each

		Calibration equipment for ensuring the accuracy of sensors and measuring devices.	
12.	Toolkits	General hand tools (screwdrivers, wrenches, pliers) for assembly and maintenance. Specialized toolkits for electronics and mechatronics.	15 each

Classroom Aids

The aids required to conduct sessions in the classroom are:

1. Laptop
2. Projector
3. Cloud access
4. Learning management system

Annexure: Industry Validations Summary

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

S. No	Organization Name	Representative Name	Designation	Contact Address	Contact Phone No	E-mail ID	LinkedIn Profile *(if available)*
1.	Maxbyte Technologies Private Limited	Mr. Sabarinathan D	Chief Innovation & Products	4th Floor, No – 218, Cowley Brown Road, R.S Puram, Coimbatore– Tamil Nadu, India	9786422542	dss@maxbytetech.com	
2.	Indian Machine Tool Manufacturers' Association	Mr. P. J. Mohanram	Principal Advisors	10th Mile, Tumkur Road, Madavara Post, Bangalore – 562123	8066246600	Imtma@imtma.in	
3.	Indian Textile Accessories & Machinery Manufacturers' Association	Mr. N D Mhatre	Director General (Tech)	Bhogilal Hargovindas Bldg., 4th Floor, 18/20, K. Subhash Marg, Kala Ghoda, Mumbai – 400001	02222844350	Info@itamma.org	
4.	Plastics Machinery Manufacturers' Association of India	Mr. Mahendra Patel	Chairman	New Delhi YMCA Tourist Hotel, Gate No.1, 1st Floor, Jai Singh Road, Delhi – 110001	01143586061	Info@pmmai.org	

5.	Parametric Technology (India) Pvt. Ltd.	Mr. Rajkiran C	Senior Director (IIoT & AR technologies)	Level 6, Nitesh Timesquare. #8 MG Road, Bengaluru – 560001	8066734300	amarathe@ptc.com	
6.	TVS Motor Company	Dr. S. Devarajan	Sr. Vice President (Advanced Manufacturing)	P.B. No. 4, Harita, Hosur - 635109	+91 (4344) 276780	Contactus@tvsmotor.com	

Annexure: Training & Employment Details

Training and Employment Projections:

Year	Total Candidates		Women		People with Disability	
	Estimated Training #	Estimated Employment Opportunities	Estimated Training #	Estimated Employment Opportunities	Estimated Training #	Estimated Employment Opportunities
2024	256	180	80	56	5	3
2025	280	196	94	67	8	5
2026	290	203	143	100	10	7

Data to be provided year-wise for next 3 years

Training, Assessment, Certification, and Placement Data for previous versions of qualifications:

Qualification Version	Year	Total Candidates				Women				People with Disability			
		Trained	Assessed	Certified	Placed	Trained	Assessed	Certified	Placed	Trained	Assessed	Certified	Placed
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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:

1.
2.

Content availability for previous versions of qualifications:

☐ Participant Handbook ☐ Facilitator Guide ☐ Digital Content ☐ Qualification Handbook ☐ Any Other:

Languages in which Content is available:

Annexure: 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

S. 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	Laptop, Projector, Projecting Screen, LMS.	1:1
2	☐Imparting Soft Skills, Life Skills, and Employability Skills /Mentorship to Learners	Laptop, Projector, Projecting Screen, LMS.	1:1
3	☐Showing Practical Demonstrations to the learners	As per attached tool list.	NA
4	☐Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	As per attached tool list.	NA
5	☐Tutorials/ Assignments/ Drill/ Practice	As per attached tool list.	NA
6	☐Proctored Monitoring/ Assessment/ Evaluation/ Examinations	As per attached tool list.	NA
7	☐On the Job Training (OJT)/ Project Work Internship/ Apprenticeship Training	As per attached tool list.	NA

Annexure: 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
Configure, install electronic components in the mechatronics systems CSC/N0507 V1.0	*Install, test and use sensors*	**15**	**30**	**-**	**8**
	PC1. select the appropriate contact or contactless sensors for installation as appropriate	-	-	-	-
	PC2. install the selected sensors such as procedure	-	-	-	-
	PC3. test the sensors for correct functioning after	-	-	-	-
	PC4. check the working of the strain gauge sensor	-	-	-	-
	PC5. determine the measurement of position and				

		-	-	-	-
	PC6. use the capacitive segment by replacing the	-	-	-	-
	PC7. use the inductive sensor to measure high	-	-	-	-
	PC8. check the position of the piston in the	-	-	-	-
	PC9. detect weak infrared irradiation caused by	-	-	-	-
	PC10. measure the electrical potential caused by	-	-	-	-
	PC11. carry out repair and maintenance of sensors	-	-	-	-
	Install, test and use actuators	**15**	**25**	**-**	**7**
	PC12. select the appropriate analogue or digital	-	-	-	-
	PC13. install an actuator with the appropriate	-	-	-	-
	PC14. use the appropriate interface circuitry to match the actuator to the system driving it	-	-	-	-
	PC15. test the actuator for correct functioning after installation	-	-	-	-
	PC16. carry out troubleshooting for any issues identified with the installed hydraulic and pneumatic actuator as per the sketches and block diagrams	-	-	-	-
	PC17. debounce the keypads to use the mechanical switches as required	-	-	-	-
	PC18. install and use the vane motor as per the standard procedure	-	-	-	-
	PC19. control high-powered circuit using a lower power signal through electro-mechanical and solid- state relays	-	-	-	-
	PC20. use the stepper motor to convert electrical power into mechanical power	-	-	-	-

	PC21. create analytical design and development solutions for actuators for different applications	-	-	-	-
	PC22. carry out repair and maintenance of actuators				
	Total Marks	**30**	**55**	**-**	**15**
Align, test electronic sensors and actuators in the mechatronics system CSC/N0508 V1.0	*Install, test and use sensors*	**15**	**30**	**-**	**8**
	PC1. select the appropriate contact or contactless sensors for installation as appropriate	-	-	-	-
	PC2. install the selected sensors such as potentiometer sensor following the standard procedure	-	-	-	-
	PC3. test the sensors for correct functioning after installation	-	-	-	-
	PC4. check the working of the strain gauge sensor and measure the torque applied by the motor	-	-	-	-
	PC5. determine the measurement of position and displacement using the eddy current sensor	-	-	-	-
	PC6. use the capacitive element by replacing the mechanical buttons	-	-	-	-
	PC7. use the inductive sensor to measure high precision measurements of displacement, distance, oscillation in harsh industrial environments	-	-	-	-
	PC8. check the position of the piston in the cylinder by using the pneumatic sensor				
	PC9. detect weak infrared irradiation caused by temperature fluctuation by using a pyro-electric sensor				
	PC10. measure the electrical potential caused by applying mechanical force to a piezoelectric material by using a piezoelectric sensor	-	-	-	-
	PC11. carry out repair and maintenance of sensors	-	-	-	-
	Install, test and use actuators	**15**	**25**	**-**	**7**
	PC12. select the appropriate analogue or digital actuators to install in electrical and hydraulic systems to control various physical quantities	-	-	-	-
	PC13. install an actuator with the appropriate				
	PC14.Use the appropriate interface circuitry to match the actuator to the system driving it	-	-	-	-

	PC15.test the actuator for correct functioning after installation				
	PC16.carry out troubleshooting for any issues identified with the installed hydraulic and				
	pneumatic actuator as per the sketches and block diagrams				
	PC17.debounce the keypads to use the mechanical switches as required				
	PC18.install and use the vane motor as per the standard procedure				
	PC19.control high-powered circuit using a lower power signal through electro-mechanical and solid- state relays				
	PC20.use the stepper motor to convert electrical				
	power into mechanical power				
	PC21.create analytical design and development solutions for actuators for different applications				
	PC22.carry out repair and maintenance of actuators				
	Total Marks	**30**	**55**	**-**	**15**
Configure and test the microcontroller in the mechatronics system CSC/N0424 V1.0	*Install, test and use microcontroller*	**30**	**55**	**-**	**15**
	PC1.sCGct an appropriate microcontroller to install according to the intended application in	-	-	-	-
	the mechatronics system				
	PC2.install the microcontroller as per the standard procedure and link the function of microcontroller structure in hardware interfacing units of the mechatronics system				
	PC3.test the microcontroller after installation to ensure it functions as expected	-	-	-	-
	PC4.program the microcontroller to execute a specific set of instructions				
	PC5.test the functioning of the machine using the mechatronics system				
	PC6.carry out interfacing of Analog-To-Digital (A/D) and Digital-To-Analog (D/A) convertors using the appropriate type of microcontroller				
	PC7.compose and program stepper motor using the appropriate type of microcontroller	-	-	-	-
	PC8.compose and program Advanced RISC Machine (ARM) and microprocessor with stepper motor				
	PC9.carry out repair and maintenance of	-	-	-	-
	Total Marks	**30**	**55**		**15**

Collaboratively coordinate with the team CSC/N1339 V1.0	*Communicate effectively at the workplace*			-	-
	PC1.exchange information and instruction with colleagues, and seek clarifications and feedback			-	-
	PC2.assist colleagues where required			-	-
	PC3.follow business communication etiquette in all interactions and communicative formats (online, digital, and in-person)			-	-
	PC4.document and share all relevant information with stakeholders in agreed formats and as per agreed timelines				
	Work effectively			-	-
	PC5.identify and obtain clarity regarding organizational, team and own goals and targets			-	-
	PC6.prioritise and plan work in order to achieve goals and targets			-	-
	PC7.monitor own and team performance as per agreed plan			-	-
	PC8.complete duties accurately, systematically and within required timeframes			-	-
	PC9.express emotions appropriately at the workplace and manage own response to heightened emotions			-	-
	PC10.maintain orderliness and cleanliness in the work area Maintain and enhance professional competence			-	-
	PC11.identify own strengths and weaknesses in relation to goals and targets			-	-
	PC12.adapt self, service, or product to meet success criteria			-	-
	PC13.seek and select opportunities for continuous professional development			-	-
	PC14.formulate a professional development plan to enhance capabilities			-	-
	PC15.build or contribute to the organizational knowledge base of cases, clients, issues, solutions, and innovations			-	-
	PC16.examine developments and trends in field of work and their potential impact on work			-	-
	PC17.take feedback from peers, supervisors and clients to improve own performance and practices			-	-
	Work in a disciplined and ethical manner			-	-
	PC18.perform tasks as per workplace standards, organizational policies and legislative requirements			-	-
	PC19.display appropriate professional appearance at the workplace and adhere to the organizational dress code			-	-

	PC20.demonstrate responsible and disciplined behavior at the workplace such as punctuality; completing tasks as per given time and standards; demonstrating professional behavior at all times, adopting environment- friendly practices, etc.			-	-
	PC21.identify the cause of conflict and options for resolution with peers or escalate grievances and problems to appropriate authority as per procedure for conflict resolution			-	-
	PC22.protect the rights of the client and organization when delivering services			-	-
	PC23.ensure services are delivered equally to all clients regardless of personal and cultural beliefs			-	-
	PC24.operate within an agreed ethical code of practice and report unethical conduct to the appropriate authorities			-	-
	PC25.follow organizational guidelines and legal requirements on disclosure and confidentiality			-	-
	Uphold social diversity at the workplace			-	-
	PC26.recognize and evaluate biased practices against underrepresented groups like women and persons with disabilities, in workplace systems and processes			-	-
	PC27.identify and report discrimination and harassment based on gender, disability, or cultural difference at the workplace			-	-
	PC28.use inclusive or neutral language and gestures in all interactions			-	-
	PC29.respect the personal and professional space of others			-	-
	PC30.access grievance redressal mechanisms as per legislations			-	-
	Total Marks	**30**	**70**		
Follow health, safety and environment guidelines at workplace CSC/N0424 V1.0	*Adhere to standard safety procedures of theorganization*			-	-
	PC1. comply with general safety procedures andthose for handling equipment, tools, chemicals, and hazardous material, as prescribed and followed in the organization			-	-
	PC2. remove finger rings or any other metalobjects likely to interfere with the work			-	-
	PC3. ensure that identification badge or any otherobject worn around the neck or on the clothing does not get caught in any rotating machine, or otherwise interfere with the work			-	-
	PC4. use appropriate safety devices such as goggles, gloves, ear plugs, caps, ESD pins, covers,shoes, helmets etc. recommended for the work being performed			-	-
	PC5. inform, escalate, or raise alarm about anysuspicions, unaccounted hazardous material, devices, or other objects found in the premises			-	-

	PC6. inform, escalate, or raise alarm about anybreach of safety or security procedure in the organization			-	-
	PC7. help achieve zero accidents goals at work			-	-
	PC8. avoid damage to sensitive electronic components due to negligence of ESD procedures			-	-
	PC9. participate regularly in fire drills or othersafety related workshops organized by the organization			-	-
	PC10. follow strictly all access control and perimeter safety procedures in designated factoryareas such as robotic work stations, automated production lines, automated material movement and other potentially risky operations			-	-
	PC11. ensure that other people follow all access control and perimeter safety procedures in designated factory areas and help avoid accidents			-	-
	PC12. use emergency switches or other mechanisms of stopping a machine immediately incase any emergency situation has developed or about to happen			-	-
	PC13. ensure that electrical equipment areproperly grounded			-	-
	PC14. follow Cyber Security guidelines and be vigilant at workplace			-	-
	PC15. proceed to designated safe assembly area immediately on hearing fire alarm			-	-
	Follow healthy practices and posture			-	-
	PC16. wash hands and use sanitizers as recommended to prevent spread of diseases			-	-
	PC17. follow common personal hygiene practices			-	-
	PC18. maintain appropriate posture, especially in long hours of sitting or standing position and in handling heavy materials			-	-
	PC19. participate in company organised health sessions such as exercises, games, yoga, physiotherapy, and other activities			-	-
	PC20. handle heavy and hazardous materials with care, while maintaining appropriate posture, using suitable tools, and handling equipment such as trolleys, jacks, and ladders			-	-

	PC21. learn and apply first aid devices available in the workplace			-	-
	PC22. learn and apply safety and handling procedures for electrical shock and electrocution			-	-
	PC23. learn and apply emergency medical help services			-	-
	PC24. follow workplace decorum and avoid emotional outbursts or inappropriate language			-	-
	PC25. prevent any harassment at workplace			-	-
	Practice waste management and recycling			-	-
	PC26. identify recyclable, non-recyclable, and hazardous waste generated in the workplace and comply with their disposal procedures			-	-
	PC27. dispose non-recyclable waste and hazardous waste following recommended processes			-	-
	PC28. deposit recyclable and reusable material at identified locations			-	-
	PC29. support education and compliance of waste management processes			-	-
	Conserve material and resources			-	-
	PC30. identify ways to optimize usage of material and resources such as water, electricity, energy in various tasks, activities, and processes			-	-
	PC31. check for spills and leakages of material in various tasks, activities, and processes and plug them			-	-
	PC32. escalate the leakage issue to appropriate authority if needed			-	-
	PC33. carry out routine cleaning of tools, machines, and equipment and maintain them in good working condition to optimize efficiency and wastage			-	-
	PC34. check if the equipment is functioning normally before commencing work and rectify or report any malfunctioning to the responsible agency			-	-
	PC35. check for any odour, sparks, fumes, emission, unusual vibration, noise, or				

	any other objectionable presence in the environment and take immediate corrective action followed by report to responsible agency			-	-
	PC36. ensure electrical equipment are properly connected for use and are switched off when not in use			-	-
	PC37. support education and compliance of resource conservation processes			-	-
	Total Marks	**15**	**20**		
Employability Skills (60 Hours) DGT/VSQ/N0102 V1.0	*Introduction to Employability Skills*	**1**	**1**	-	-
	PC1. identify employability skills required for jobsin various industries	-	-	-	-
	PC2. identify and explore learning andemployability portals	-	-	-	-
	Constitutional values – Citizenship	**1**	**1**	-	-
	PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. andpersonal values and ethics such as honesty, integrity, caring and respecting others, etc.	-	-	-	-
	PC4. follow environmentally sustainable practices	-	-	-	-
	Becoming a Professional in the 21st Century	**2**	**4**	-	-
	PC5. recognize the significance of 21st CenturySkills for employment	-	-	-	-
	PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life	-	-	-	-
	Basic English Skills	**2**	**3**	-	-
	PC7. use basic English for everyday conversationin different contexts, in person and over the telephone	-	-	-	-
	PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English	-	-	-	-
	PC9. write short messages, notes, letters, e-mailsetc. in English	-	-	-	-
	Career Development & Goal Setting	**1**	**2**	-	-
	PC10. understand the difference between job andcareer	-	-	-	-

	PC11. prepare a career development plan withshort- and long-term goals, based on aptitude	-	-	-	-
	Communication Skills	**2**	**2**	-	-
	PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings	-	-	-	-
	PC13. work collaboratively with others in a team	-	-	-	-
	Diversity & Inclusion	**1**	**2**	-	-
	PC14. communicate and behave appropriatelywith all genders and PwD	-	-	-	-
	PC15. escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
	Financial and Legal Literacy	**2**	**3**	-	-
	PC16. select financial institutions, products andservices as per requirement	-	-	-	-
	PC17. carry out offline and online financialtransactions, safely and securely	-	-	-	-
	PC18. identify common components of salary andcompute income, expenses, taxes, investments etc.	-	-	-	-
	PC19. identify relevant rights and laws and uselegal aids to fight against legal exploitation	-	-	-	-
	Essential Digital Skills	**3**	**4**	-	-
	PC20. operate digital devices and carry out basicinternet operations securely and safely	-	-	-	-
	PC21. use e- mail and social media platforms andvirtual collaboration tools to work effectively	-	-	-	-
	PC22. use basic features of word processor,spreadsheets, and presentations	-	-	-	-
	Entrepreneurship	**2**	**3**	-	-
	PC23. identify different types of Entrepreneurshipand Enterprises and assess opportunities for potential business through research	-	-	-	-
	PC24. develop a business plan and a work model,considering the 4Ps of Marketing Product, Price, Place and Promotion	-	-	-	-
	PC25. identify sources of funding, anticipate, andmitigate any financial/ legal hurdles for the potential business opportunity	-	-	-	-

	Customer Service	**1**	**2**	-	-
	PC26. identify different types of customers	-	-	-	-
	PC27. identify and respond to customer requestsand needs in a professional manner.	-	-	-	-
	PC28. follow appropriate hygiene and groomingstandards	-	-	-	-
	Getting ready for apprenticeship & Jobs	**2**	**3**	-	-
	PC29. create a professional Curriculum vitae(Résumé)	-	-	-	-
	PC30. search for suitable jobs using reliable offlineand online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively	-	-	-	-
	PC31. apply to identified job openings using offline /online methods as per requirement	-	-	-	-
	PC32. answer questions politely, with clarity andconfidence, during recruitment and selection	-	-	-	-
	PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements	-	-	-	-
	Total Marks	**20**	**30**		
Grand Total		**155**	**284**		**45**

Annexure: Assessment Strategy

This section includes the processes involved in identifying, gathering, and interpreting information to evaluate the Candidate on the required competencies of the program.

Mention the detailed assessment strategy in the provided template.

1. Assessment System Overview:
   - Batches assigned to the assessment agencies for conducting the assessment on SIP or email
   - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
   - Assessment agency deploys the ToA certified Assessor for executing the assessment
   - SSC monitors the assessment process & records
2. Testing Environment:
   - Check the Assessment location, date and time
   - If the batch size is more than 30, then there should be 2 Assessors.
   - Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
3. Assessment Quality Assurance levels/Framework:
   - Question bank is created by the Subject Matter Experts (SME) are verified by the other SME

- Questions are mapped to the specified assessment criteria
- Assessor must be ToA certified & trainer must be ToT Certified

4. Types of evidence or evidence-gathering protocol:
   - Time-stamped & geotagged reporting of the assessor from assessment location
   - Centre photographs with signboards and scheme specific branding
5. Method of verification or validation:
   - Surprise visit to the assessment location
6. Method for assessment documentation, archiving, and access
   - Hard copies of the documents are stored

On the Job:

1. Each module (which covers the job profile of Automotive Service Assistant Technician) will be assessed separately.
2. The candidate must score 60% in each module to successfully complete the OJT.
3. Tools of Assessment that will be used for assessing whether the candidate is having desired skills and etiquette of dealing with customers, understanding needs & requirements, assessing the customer and perform Soft Skills effectively:
   • Videos of Trainees during OJT
4. Assessment of each Module will ensure that the candidate is able to:

- Effective engagement with the customers
- Understand the working of various tools and equipment

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