

QUALIFICATION FILE – Standalone NOS

Foundations of IoT

☒ Horizontal/Generic ☒ Vertical/Specialization

☒ Upskilling ☐ Dual/Flexi Qualification ☐ For ToT ☐ For ToA

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

NCrF/NSQF Level: 4.5

Submitted By:

IT-ITeS Sector Skills Council NASSCOM (SSC NASSCOM)

Plot No. – 7, 8, 9 & 10

Sector – 126, Noida, Uttar Pradesh - 201303

Table of Contents

Section 1: Basic Details 3

Section 2: Training Related..... 5

Section 3: Assessment Related..... 5

Section 4: Evidence of the Need for the Standalone NOS..... 6

Section 5: Annexure & Supporting Documents Check List..... 7

 Annexure: Evidence of Level 7

 Annexure: Tools and Equipment (lab set-up)..... 10

 Annexure: Industry Validations Summary 11

 Annexure: Training Details 12

 Annexure: Blended Learning 12

 Annexure: Standalone NOS- Performance Criteria details..... 13

 Annexure: Assessment Criteria 14

 Annexure: Assessment Strategy 14

 Annexure: Acronym and Glossary 16

Section 1: Basic Details

1.	NOS	Foundations of IoT																
2.	Sector/s	IT/ITeS																
3.	Type of Qualification ☒ New ☐ Revised	NQR Code & version of the existing /previous qualification:	Qualification Name of the existing/previous version: <i>Foundation of IoT</i>															
4.	National Qualification Register (NQR) Code & Version <i>(Will be issued after NSQC approval.)</i>	NG-4.5-IT-03787-2025-V1-NASSCOM & V1	5. NCrF/NSQF Level: 4.5															
6.	Brief Description of the Standalone NOS	This NOS describes the fundamentals of IoT																
7.	Eligibility Criteria for Entry for a Student/Trainee/Learner/Employee	a. Entry Qualification & Relevant Experience: <table border="1"> <thead> <tr> <th>S.No.</th> <th>Academic/Skill Qualification (with Specialization - if applicable)</th> <th>Relevant Experience (with Specialization - if applicable)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Pursuing 1st Year of 3Y/4Y UG Program in STEM</td> <td>-</td> </tr> <tr> <td>2</td> <td>Completed 1st year of 3Y/4Y UG Program in STEM</td> <td>-</td> </tr> <tr> <td>3</td> <td>Passed Class 12th or equivalent in STEM</td> <td>1.5 Years of relevant experience (including work, internship, and apprenticeship) in IoT</td> </tr> <tr> <td>4</td> <td>Previous relevant qualification of NSQF Level 4</td> <td>1.5 Years of relevant experience (including work, internship, and apprenticeship) in IoT</td> </tr> </tbody> </table> b. Age: NA		S.No.	Academic/Skill Qualification (with Specialization - if applicable)	Relevant Experience (with Specialization - if applicable)	1	Pursuing 1st Year of 3Y/4Y UG Program in STEM	-	2	Completed 1st year of 3Y/4Y UG Program in STEM	-	3	Passed Class 12th or equivalent in STEM	1.5 Years of relevant experience (including work, internship, and apprenticeship) in IoT	4	Previous relevant qualification of NSQF Level 4	1.5 Years of relevant experience (including work, internship, and apprenticeship) in IoT
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8.	Credits Assigned to this NOS-Qualification, Subject to Assessment <i>(as per National Credit Framework (NCrF))</i>	1.5 Credits	9. Common Cost Norm Category (I/II/III) <i>(wherever applicable): II</i>															
10.	Any Licensing Requirements for Undertaking Training on This Qualification <i>(wherever applicable)</i>	NA																

11.	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 Only ☐ Online Only ☒ Blended <table border="1" data-bbox="1025 256 1912 405"> <thead> <tr> <th>Training Delivery Mode</th> <th>Theory (Hours)</th> <th>Practical (Hours)</th> <th>OJT (Hours)</th> <th>Total (Hours)</th> </tr> </thead> <tbody> <tr> <td>Classroom (offline)</td> <td>27</td> <td>18</td> <td>00</td> <td>45</td> </tr> <tr> <td>Online</td> <td>27</td> <td>18</td> <td>00</td> <td>45</td> </tr> </tbody> </table> (Refer Blended Learning Annexure for details)	Training Delivery Mode	Theory (Hours)	Practical (Hours)	OJT (Hours)	Total (Hours)	Classroom (offline)	27	18	00	45	Online	27	18	00	45
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12.	Assessment Criteria	<table border="1" data-bbox="1025 563 1982 675"> <thead> <tr> <th>Theory (Marks)</th> <th>Practical (Marks)</th> <th>Project (Marks)</th> <th>Viva (Marks)</th> <th>Total (Marks)</th> <th>Passing %age</th> </tr> </thead> <tbody> <tr> <td>30</td> <td>70</td> <td>-</td> <td>-</td> <td>100</td> <td>50%</td> </tr> </tbody> </table>	Theory (Marks)	Practical (Marks)	Project (Marks)	Viva (Marks)	Total (Marks)	Passing %age	30	70	-	-	100	50%			
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30	70	-	-	100	50%												
13.	Is the NOS Amenable to Persons with Disability	☒ Yes ☐ No If “Yes”, specify applicable type of Disability: Visual, Hearing or Speech impairment, Locomotor Disability															
14.	Progression Path After Attaining the Qualification, wherever applicable (<i>Please show Professional and Academic progression</i>)	After completing this program, participants can take up entry-level roles in IoT domain.															
15.	How will participation of women be encouraged?	The Program is gender-neutral, although organizations keep a few seats to increase women's participation and encourage female candidates.															
16.	Other Indian languages in which the Qualification & Model Curriculum are being submitted	<i>Once approved, the qualification will be available in Hindi or other Indian Languages.</i>															
17.	Is similar NOS available on NQR-if yes, justification for this qualification	☐ Yes ☒ No URLs of similar Qualifications:															
18.	Name and Contact Details Submitting / Awarding Body SPOC <i>(In case of CS or MS, provide details of both Lead AB & Supporting ABs)</i>	Name: Namrata Kapur Email: Standards@nasscom.in Contact No.: 0120-4990111 Website: https://nasscom.in															

19.	Final Approval Date by NSQC: 18/02/2025	20. Validity Duration:36 Months	21. Next Review Date: 18/02/2028
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Section 2: Training Related

1.	Trainer's Qualification and experience in the relevant sector (in years) <i>(as per NCVET guidelines)</i>	Educational Qualification: Graduate (Engineering/ Technology/ Computer Science) Industry & training experience: 2 years of industry experience in IoT. The industry experience would include work, internship, and apprenticeships undertaken after regular graduation. Certification: "Trainer" mapped to the Qualification Pack "MEP/Q2601" Minimum accepted score is 80% aggregate
2.	Master Trainer's Qualification and experience in the relevant sector (in years) <i>(as per NCVET guidelines)</i>	Educational Qualification: Graduate (Engineering/ Technology/ Computer Science) Industry & training experience: 4 years of industry experience in IoT. The full-time experience would include work, internship, and apprenticeship undertaken after regular graduation. Certification: "Master Trainer" mapped to the Qualification Pack "MEP/Q2602" Minimum accepted score is 90% aggregate.
3.	Tools and Equipment Required for the Training	☒ Yes ☐ No (If "Yes", details to be provided in Annexure)
4.	In Case of Revised NOS, details of Any Upskilling Required for Trainer	NA

Section 3: Assessment Related

1.	Assessor's Qualification and experience in relevant sector (in years) <i>(as per NCVET guidelines)</i>	Educational Qualification: Graduate (Engineering/ Technology/ Computer Science) Industry & Training Experience: 2 years of industry experience in IoT. The full-time experience would include work, internship, and apprenticeship undertaken after regular graduation. Certification: "Assessor" mapped to the Qualification Pack "MEP/Q2701" Minimum accepted score is 80% aggregate.
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2.	Proctor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines), (wherever applicable)	Educational Qualification: Graduate (Engineering/ Technology/ Computer Science) Industry & Training Experience: 2 years of industry experience in IoT. The full-time experience would include work, internship, and apprenticeship undertaken after regular graduation. Certification: "Assessor" mapped to the Qualification Pack "MEP/Q2701" Minimum accepted score is 80% aggregate.
3.	Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)	Educational Qualification: Graduate (Engineering/ Technology/ Computer Science) Industry & Training Experience: 4 years of industry experience in IoT. The full-time experience would include work, internship, and apprenticeship undertaken after regular graduation. Certification: "Lead Assessor" mapped to the Qualification Pack "MEP/Q2702" Minimum accepted score is 90% aggregate.
4.	Assessment Mode (Specify the assessment mode)	The assessment will consist of a blend of hands-on practical evaluations and online proctored scenario-based multiple-choice questions ensuring a thorough evaluation of the individual's proficiency in learning outcomes, practical understanding, and real-world application of concepts.
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 4: Evidence of the Need for the Standalone NOS

Provide Annexure/Supporting documents name.

1.	Government /Industry initiatives/ requirement (Yes/No): Industry initiative
2.	Number of Industry validations provided: 11
3.	Estimated number of people to be trained: As per Draup's AI Power Search, the employed talent in the Web and Mobile industry in 2024 is ~314,000. The annual demand is at~52000 in 2024
4.	Evidence of Concurrence/Consultation with Line/State Departments (In case of regulated sectors): (Yes/No): Applied If "No", why: This is an industry-led program (In this case, IBM) and multiple industry partners are already developing/aligning to similar programs

Section 5: Annexure & Supporting Documents Check List

Specify Annexure Name / Supporting document file name

1.	Annexure: NCrf/NSQF level justification based on NCrf/NSQF descriptors <i>(Mandatory)</i>	Evidence of Level
2.	Annexure: List of tools and equipment relevant for NOS <i>(Mandatory, except in case of online course)</i>	Tools and Equipment (lab set-up)
3.	Annexure: Performance and Assessment Criteria <i>(Mandatory)</i>	Performance Criteria Details
4.	Annexure: Assessment Strategy <i>(Mandatory)</i>	Assessment strategy
5.	Annexure: Blended Learning <i>(Mandatory, in case selected Mode of delivery is Blended Learning)</i>	NA
6.	Annexure: Acronym and Glossary <i>(Optional)</i>	Acronym and Glossary
7.	Annexure/Supporting Document: Standalone NOS- Performance Criteria Details Annexure/Document with PC-wise detailing as per NOS format (Mandatory- Public view)	NOS_ Foundation of IoT
8.	Supporting Document: Model Curriculum <i>(Mandatory – Public view)</i>	MC_ Foundation of IoT_V1

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	Define functional requirements of the IoT solution.	To perform his/her role effectively, the individual requires a basic understanding in IoT devices, device testing, gateway testing, platform testing, IoT networking and	4.5

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
	Gather business and societal impact benefits of IoT. Create or modify test scenarios relevant to the requirements. Create or modify software test cases relevant to the requirements. Use Application Management Services · Monitor and manage deployed applications	communication transforming businesses and customer use cases.	
Professional and Technical Skills/ Expertise/ Professional Knowledge	IoT use cases and applications across industries. IoT technology stack, basic IoT architecture designs. Applications of various components used in IoT solutions. Basic electronic designs of IoT components. Fundamentals of data analytics in IoT solutions.	The individual in the role must have a basic knowledge of IoT solutions, software development, IoT security, and IoT network infrastructure. This knowledge across various disciplines must be accompanied by an overall understanding of each discipline to perform this role effectively.	4.5
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	Knowledge of basic IoT architecture designs, IoT technology stack, IoT solutions and components	The role demands a skill set that allows the individual to explore the use cases of IoT in various industries. This requires a wide range of skills. The individual, therefore, needs to have a good understanding of IoT software	4.5

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
	Basics of IoT network concepts such as gateways, Service-oriented Architecture, interoperability, M2M and network scalability Fundamentals of data architectures, data platforms and databases used to store IoT data	development, testing, networking, and storage concepts.	
Broad Learning Outcomes/Core Skill	Knowledge of design, develop and maintain software applications, libraries, server software and APIs How to design, develop and maintain reports, graphs, and visualization dashboards of IoT solution Different sources of information available for designing tests and how to access these Difference between different types of testing such as unit, sub-system, system, automated	The individual must apply his/her statistical skills along with a sound understanding of programming. This would enable him/her to understand AI concepts better.	4.5
Responsibility	Pass on relevant information to others Apply balanced judgments to different situations Development of knowledge, skills, and competences Build and maintain relationships with colleagues and other teams	The role demands working in a team to ensure performance and usability of IoT solutions and to create and maintain software. This may involve helping peers with their work from time to time.	4.5

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
	Convince others to take appropriate action in different situations		

Annexure: Tools and Equipment (lab set-up)

List of Tools and Equipment

Batch Size:

S. No.	Tool / Equipment Name	Specification	Quantity for specified Batch size
1	PC/Laptop with internet	-	1 Unit per Trainee
2	Node-RED	A flow-based development tool for visual programming, particularly useful for wiring together devices, APIs, and online services in IoT applications.	Access/Installed to each System
3	Arduino IDE	Open-source platform used for programming Arduino boards	Access/Installed to each System
4	Mosquitto	Open-source message broker that implements the MQTT protocol, ideal for IoT communication between devices.	Access/Installed to each System
5	InfluxDB	Database	Access/Installed to each System
6	OpenSSL	Tools for encryption	Access/Installed to each System

Classroom Aids

The aids required to conduct sessions in the classroom are:

1. White Board
2. White Board Marker
3. Projector

Annexure: Industry Validations Summary

S. No	Organization Name	Representative Name	Designation	Contact Address	Contact Phone No	Email ID	LinkedIn Profile
1	Accolite Digital	Ayushmaan Pandey	Senior Software Engineer		8077386365	ayushmaan.pandey@accolitedigital.com	https://www.linkedin.com/in/ayushmaanpandey
2	Delta Electronics India	Kabilan R D	Project Management		7010811080	kabilanrdurai@outlook.com	https://www.linkedin.com/in/kabilan-r-d-b09856122
3	Tride	Madhav Reddy	CEO		8499989071	madhav@tridemobility.in	https://in.linkedin.com/in/madhavarpireddy
4	Synergy Software Systems	Aravind Raj	Functional Consultant		+971 555782899	aravindrajjayachandran@gmail.com	-
5	Skillsda	Sankar Vijyan/Kottaram Ramesh	Director		9894801793/9500123029	sv@skillsda.com/ram@skillsda.com	https://www.linkedin.com/in/kottaram-v-ramesh/
6	IndiaFilings Private Limited	Vairavan k	Web Developer		9944127279	vairavanaravind92@gmail.com	-
7	BBSSL	Sanjay	Senior software engineer		8438175943	sanjayrameshbabu.97@gmail.com	https://www.linkedin.com/in/sanjay-rameshbabu
8	Grootan technologies	Anuraga	Customer Success Executive		9500662718	anuragaprabakaran@gmail.com	https://www.linkedin.com/in/anuraga-prabakaran
9	Desicrew Solutions Pvt Ltd	Deepa Rasu	Senior Crewmate	-	9360794643	deepadesicrew@gmail.com	-
10	Kornferry	Ragul	Data analyst	-	9659964881	ragulblooper143@gmail.com	https://www.linkedin.com/in/ragul-kumar-b2297a171/
11	Accenture	Indrajeet	Business Transformation Manager	-	9937366768	indra.jeet@accenture.com	https://www.linkedin.com/in/indrajeet1988/

Annexure: Training Details

Training Projections:

Year	Estimated Training # of Total Candidates	Estimated training # of Women	Estimated training # of People with Disability

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 NOS	List Recommended Tools – for all Selected Components	Offline: Online Ratio
1	☐ Theory/ Lectures - Imparting theoretical and conceptual knowledge	NA	NA
2	☐ Imparting Soft Skills, Life Skills and Employability Skills /Mentorship to Learners	NA	NA
3	☐ Showing Practical Demonstrations to the learners	NA	NA
4	☐ Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	NA	NA
5	☐ Tutorials/ Assignments/ Drill/ Practice	NA	NA
6	☐ Proctored Monitoring/ Assessment/ Evaluation/ Examinations	NA	NA
7	☐ On the Job Training (OJT)/ Project Work Internship/ Candidate Training	NA	NA

Annexure: Standalone NOS- Performance Criteria details

1. Description: This NOS describes the fundamentals of IoT

2. Scope:

The scope covers the following:

- IoT fundamentals.

3. Elements and Performance Criteria

PC1 Discuss key application areas of IoT.

PC2 Explain fundamentals of IoT devices such as sensors, microcontrollers.

PC3 Design and develop networking and connectivity solutions across the IoT stack.

PC4 Collect, store and analyse data obtained from disparate sources across the IoT stack.

PC5 Implementation of security guidelines and architecture across the IoT solution.

4. Knowledge and Understanding (KU):

KA1. Organizational policies and procedures for sharing data.

KA2. Organizational policies and procedures for documentation

KB1. Popular IoT Tools/Software/platforms and differences in their functionalities

KB2. Basic Understanding of information technology.

5. Generic Skills (GS):

GS1. Work independently and collaboratively.

GS2. Communicate with others in writing.

GS3. Ability to understand business impact and disseminate relevant information to others.

GS4. Check the work is complete and free from errors.

GS5. Apply balanced judgments to different situations.

Annexure: Assessment Criteria

Detailed PC-wise assessment criteria and assessment marks for the NOS are as follows:

S. No.	Assessment Criteria for Performance Criteria	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC 1.	Discuss key application areas of IoT	6	-	-	-
PC 2.	Explain the fundamentals of IoT devices such as sensors, microcontrollers	6	17	-	-
PC 3.	Design and develop networking and connectivity solutions across the IoT stack	6	17	-	-
PC 4.	Collect, store, and analyse data obtained from disparate sources across the IoT stack	6	18	-	-
PC 5.	Implementation of security guidelines and architecture across the IoT solution	6	18	-	-
Total Marks		30	70	-	-

Annexure: Assessment Strategy

Assessment System Overview

Batch Creation & Assessment Request:

Training Providers (TP) or Training Centers (TC), including any other authorized partner of Ministry/ Department create batches / push batches on the SIDH portal. Assessment requests are submitted through the SIDH portal or via email or other media as authorized from time to time. For NON-SIDH schemes, assessment requests

are received electronically or through respective State Skill Mission portals. TP/TC initiates the assessment request through the InSDMS portal and processes the payment (where applicable).

Batch Alignment & Confirmation:

Upon payment confirmation, batches are assigned to the Assessment Agency based on factors like:

- Assessment readiness
- Availability of certified assessors for the specific job role
- Assessment capping to an assessment agency as prescribed from time to time for an AB An email communication / prescribed mode communication is sent to TP/TC for confirmation of the assessment date, with IT-ITeS SSC in the loop. Once confirmation is received, the Assessment Agency designates a TOA-certified assessor to conduct or facilitate the assessment.
- Batches are only formed when the Qualification is active.

Candidate Verification & Assessment Execution:

Candidate details are verified and documented at the beginning of the assessment by a certified assessor. A Quality Assurance (QA) mechanism is enforced, requiring an undertaking from the TC. Regular feedback is collected from TP/TC to ensure continuous improvement.

Evidence Collection & Validation:

Proctors or assessors capture date/time-stamped and geo-tagged photographs of the assessment location during the process. Attendance is also ensured offline. A PC-wise result analysis is conducted to refine assessment standards.

Monitoring & Compliance:

Batch monitoring follows established protocols, ensuring adherence to assessment guidelines. Sample based surprise visits are conducted at TC locations during both training and assessments to verify compliance. This structured approach ensures transparency, quality control, and validation throughout the assessment process.

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.

Assessment Quality Assurance levels/Framework:

IT-ITeS SSC nasscom is responsible for the development and periodic review of the question bank developed for a specific job role. We publish an openly accessible sample /model question paper on our website for all stakeholders. The quality of the Question Bank created by the assessment designer is validated by a Subject matter experts on the following parameters:

- Appropriateness of the Question Bank in terms of facts, data and information.
- Checks for grammar, spellings, scripting and formatting.
- The information provided should be specific enough to remove any ambiguity in answers/solutions to the question.
- Relevance – Assessing the topic well w.r.t. the job role.
- Check if the difficulty level of each question is as per the matrix.
- Check if the images used in the question are clear and relevant.
- All variables, symbols and abbreviations used must be declared.
- The correct answer option should be unique, and the options should not be overlapping

Annexure: Acronym and Glossary

Acronym

Acronym	Description
AA	Assessment Agency
AB	Awarding Body
NCrF	National Credit Framework
NOS	National Occupational Standard(s)
NQR	National Qualification Register
NSQF	National Skills Qualifications Framework

Glossary

Term	Description
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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 based on their main economic function, product, service or technology.