QUALIFICATION FILE–Standalone NOS

Fundamentals of Internet of Things

☐ Horizontal/Generic ☐Vertical/Specialization

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

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

NCrF/NSQF Level: 4

Submitted By:

National Institute of Electronics and Information Technology (NIELIT)

NIELIT Bhawan,

Plot No. 3, PSP Pocket, Sector-8,

Dwarka, New Delhi-110077,

Phone: 91-11-2530 8300

E-mail: - contact@nielit.gov.in

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Section 1: Basic Details

<table>
<tr><td>1.</td><td>NOS-Qualification Name</td><td colspan="2">Fundamentals of Internet of Things</td></tr>
<tr><td>2.</td><td>Sector/s</td><td colspan="2">Electronics</td></tr>
<tr><td>3.</td><td>Type of Qualification ☐ New ☒ Revised</td><td>NQR Code & version of existing/previous qualification: 2022/EHW/NIELIT/05321</td><td>Qualification Name of existing/previous version: Foundation course in Internet of Things</td></tr>
<tr><td>4.</td><td>National Qualification Register (NQR) Code & Version (Will be issued after NSQC approval.)</td><td>NG-04-EH-04418-2025-V2-NIELIT</td><td>5. NCrF/NSQF Level: 4</td></tr>
<tr><td>6.</td><td>Brief Description of the Standalone NOS</td><td colspan="2">This course is designed to enhance skill development in the IoT sector, targeting students and unemployed youth, including Diploma and Engineering graduates, to boost their employability in IoT hardware and software fields. It also aims to upgrade the skills of professionals already working in IoT and related technologies. The purpose is to demystify IoT and empower the future workforce with the confidence to independently learn and apply these skills.</td></tr>
<tr><td>7.</td><td>Eligibility Criteria for Entry for a 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>Relevant Experience (with Specialization - if applicable)</th></tr>
<tr><td>1</td><td>12th with Science subjects or equivalent</td><td rowspan="2">No Experience required</td></tr>
<tr><td>2</td><td>2nd year of 3-year diploma in CS/IT/EC/EE/allied branches after10th</td></tr>
<tr><td>3</td><td>Previous relevant Qualification of NSQF Level 3</td><td>3-year relevant experience in Embedded Systems/ Electronics/allied sector</td></tr>
<tr><td>4</td><td>Previous relevant Qualification of NSQF Level 3.5</td><td>1.5-year relevant experience in Embedded Systems/ Electronics/allied sector</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>8.</td><td>Credits Assigned to this NOS-Qualification, Subject to Assessment (as per National Credit Framework (NCrF))</td><td>3 Credits</td><td>9. Common Cost Norm Category (I/II/III) (wherever applicable): Category-I</td></tr>
<tr><td>10.</td><td>Any Licensing Requirements for Undertaking Training on This Qualification (wherever applicable)</td><td colspan="2">NA</td></tr>
<tr><td>11.</td><td>Training Duration by Modes of Training Delivery(Specify Total Duration as per selected training delivery modes and as per requirement of the qualification)</td><td colspan="2">☒ Offline Only ☐Online Only ☐ Blended
<table>
<tr><th>Training Delivery Mode</th><th>Theory (Hours)</th><th>Practical (Hours)</th><th>Total (Hours)</th></tr>
<tr><td>Classroom (offline)</td><td>35</td><td>55</td><td>90</td></tr>
</table></td></tr>
<tr><td>12.</td><td>Assessment Criteria</td><td colspan="2">
<table>
<tr><th>Theory (Marks)</th><th>Practical (Marks)</th><th>Project/OJT (Marks)</th><th>Employability Skills/Internal Assessment (Marks)</th><th>Total (Marks)</th><th>Passing %age</th></tr>
<tr><td>100</td><td>25</td><td>00</td><td>00</td><td>125</td><td>50</td></tr>
</table>
The centralized online assessment is conducted by the Examination Wing, NIELIT Headquarters.
*Assessment strategy shall be as per NIELIT Norms prevailing at times.</td></tr>
<tr><td>13.</td><td>Is the NOS Amenable to Persons with Disability</td><td colspan="2">☒ Yes ☐ No
If “Yes”, specify applicable type of Disability:
i. Locomotor Disability: Leprosy Cured Person, Dwarfism, Muscular Dystrophy and Acid Attack Victims
ii. Visual Impairment: Low Vision</td></tr>
<tr><td>14.</td><td>Progression Path After Attaining the Qualification, wherever applicable (Please show Professional and Academic progression)</td><td colspan="2">IoT System Design Engineer</td></tr>
<tr><td>15.</td><td>How participation of women will be encouraged?</td><td colspan="2">Participation by women can be ensured through Government Schemes. Occasionally, exclusive batches for women would be run for the proposed courses. Funding is available for women’s participation under other schemes launched by the Government from time to time.</td></tr>
</table>

16.	**Other Indian languages in which the Qualification & Model Curriculum are being submitted**	Qualification file available in English & Hindi Language.	
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** *(In case of CS or MS, provide details of both Lead AB & Supporting ABs)*	**Name: Ankit Kumar** **Email: ankit@nielit.gov.in** **Contact No.: 9074841785** **Website:** https://www.nielit.gov.in	
19.	**Final Approval Date by NSQC: 08.05.2025**	**20. Validity Duration: 3 Years**	**21. Next Review Date: 08.05.2028**

Section 2: Training Related

1.	**Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	A-Level (IT)/MCA/ B. Tech in CS/IT/EC/EE/ allied areas with 1 year of relevant Experience in training and Specialization on (IoT).
2.	**Master Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	MCA/B-Level (IT)/B. Tech in CS/IT/EC/EE/ allied areas with an relevant experience of 3 years in training and Specialization on (IoT).
3.	**Tools and Equipment Required for the Training**	☒Yes ☐No (If "Yes", details to be provided in Annexure-II)
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)** *(as per NCVET guidelines)*	A-Level (IT)/MCA/ B. Tech in CS/IT/EC/EE/ allied areas with 3 year of relevant Experience in training and Specialization on (IoT).
2.	**Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines), (wherever applicable)*	The assessor carries out theory online assessments through the remote proctoring methodology. Theory examination would be conducted online and the paper comprise of MCQ. Conduct of assessment is through trained proctors. Once the test begins, remote proctors have full access to the candidate's video feeds and computer screens. Proctors authenticate the candidate based on registration details, pre-test image captured and I- card in possession of the candidate. Proctors can chat with candidates or give warnings to candidates. Proctors can also take screenshots, terminate a specific user's test session, or re-authenticate candidates based on video feeds.
3.	**Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	An External Examiner/ Observer (Subject matter expert) are deployed including NIELIT scientific officers who are subject expert for evaluation of Practical examination/ internal assessment / Project/ Presentation/ assignment and Major Project (if applicable). Qualification is generally B. Tech in CS / IT / EC / EE / allied areas.
4.	**Assessment Mode***(Specify the assessment mode)*	Online for Theory. Online/Offline for other assessments.
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): Yes
2.	Number of Industry validation provided: 6
3.	Estimated number of people to be trained: 7200
4.	Evidence of Concurrence/Consultation with Line/State Departments (In case of regulated sectors): (Yes/No): No **NIELIT is recognized as AB and AA under Government Category. NIELIT is an HRD arm of MeitY, therefore, the Line Ministry Concurrence is not required.**

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 *(Mandatory)*	Available at Annexure-I: Evidence of Level
2.	**Annexure:** List of tools and equipment relevant for NOS*(Mandatory, except in case of online course)*	Available at Annexure-II: Tools and Equipment
3.	**Annexure:** Training Details	Available at Annexure-IV: Training Details
4.	**Annexure:** Blended Learning *(Mandatory, in case selected Mode of delivery is Blended Learning)*	Available at Annexure-V: Blended Learning
5.	**Annexure/Supporting Document:** Standalone NOS- Performance Criteria Details Annexure/Document with PC-wise detailing as per NOS format (Mandatory- Public view)	Available at Annexure-VI: Standalone NOS- Performance Criteria details
6.	**Annexure:** Performance and Assessment Criteria*(Mandatory)*	Available at Annexure-VII: Detailed Assessment Criteria
7.	**Annexure:** Assessment Strategy*(Mandatory)*	Available at Annexure-VIII: Assessment Strategy
8.	**Annexure:** Acronym and Glossary *(Optional)*	Available at Annexure-IX: Acronym and Glossary
9.	**Supporting Document:** Model Curriculum *(Mandatory – Public view)*	Available at Annexure-A: Model Curriculum

Annexure-I: 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	1. The job holder is expected to perform his/her work with well-developed skill in implementing IoT based applications for solving particular problems in different sectors 2. Students are able to understand the concept of IoT devices and its applications. 3. Gain the understanding and learn the power of embedded system and its ecosystem	1. Possesses specialized operational knowledge and understanding of the work. 2. Have complete knowledge of the concept of time required for delivery; and Quality for a range of issues	4
Professional and Technical Skills/ Expertise/ Professional Knowledge	1Gain the understanding and learn the power of embedded system and its ecosystem 2. Students are able to understand the concept of IoT devices and its applications. 3. Students learn the code and build simple IoT applications/use 4. Working with IoT cloud platforms	1. Possesses specialized professional and technical skills; displays clarity of professional knowledge and technical skills in a broad range of activities/ tasks 2. Have knowledge of collecting and interpreting the available information, drawing conclusions & communicating the same	4

Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	1. Career Development & Goal Setting 2. Communication Skills 3. Essential Digital Skills 4. Getting Ready for Apprenticeship & Jobs	1. Can explain Entrepreneurial Mindset and describe the importance of it in the context of opportunity curation for future jobs 2. Can comfortably use most of the basic software with proficiency 3. Have the ability to relate to the 5 pillars of Social Emotional Skills and describe the similarities between SES and Emotional Intelligence	4
Broad Learning Outcomes/Core Skill	1. Build and test prototype for IoT based use cases 2. Working on various IoT hardware platforms	1. Students are able to code and build IoT based system using sensors and actuators 2. Build applications around single board computer	4
Responsibility	1. Coding Embedded development boards 2. Providing connectivity solutions for collecting data from IoT nodes	Takes complete responsibility for delivery and quality of own work and output as also the subordinates.	4

Annexure-II: 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	Classroom	1 (30 Sq.m)	30
2	Student Chair	30	30
3	Student Table	30	30
4	Desktop computer with accessories		30
5	Wireless module for IoT	NodeMCU, ESP32,HC05,Nrf,RFID	30
6	Arduino	Arduino Uno Development board	30
7	Sensors and peripherals	DHT11,ultrasonic sensor, LDR, MQ3,MQ135,water level sensor, soil moisture sensor, Motor driver, Relay, Displays	30
8	Desk jet printer	1 Nos.	A4

Classroom Aids

The aids required to conduct sessions in the classroom are:

1. LCD Projector
2. Pin-up Board
3. White Board

Annexure-III: Industry Validations Summary

S. No	Organization Name	Representative Name	Designation	Contact Address	Contact Phone No	E-mail ID
1	Programmers Point,	Smt. Bela Rani Saha	Propritor	Ujan Abhoynagar, Manipuripara, Agartala, Tripura(West), Pin-799005	0381-3561096	programmerspoint.help@gmail.com
2	Chawnghlut Computer Science	Lalrammumni	Director	M-25 First floor, Ramluhn South Aizwal, Mizoram	9862378352	chawnghlutcomy@gmail.com
3	Sidhi Vinayak Academy	Tausif Alam	State Head	Shiv Narayan Kunj, B – Block, Shivaji Nagar, Hethu, Ranchi (JH)-834002	8789326361	info.sidhiacadmey@gmail.com
4	Electrocybernetics	Jeelen Kumar Sarungbam	Propritor	Sagolband Tera, Lukram Leirak, Imphal-West, Manipur-795001	6909369699	care@electrocybernetics.com
5	Devendra Nath Institute of Information Technology (DNIIT)	Amit Kumar Tripathi	Director	Uska Road, Near Naveen Sabji , Mandi, Tetari Bazar, Siddharth Nagar 272207	8765562815	aktjob@gmail.com
6	Software World,	Akula	Founder	Ujan Abhoynagar, Manipuripara, Agartala, Tripura(West),	0381-7963527,	www.softwareworld.co.in

Annexure-IV: Training Details

Training Projections:

Year	Estimated Training # of Total Candidates	Estimated training# of Women	Estimated training# of People with Disability
2025-26	1700	400	20
2026-27	2500	1200	40
2027-28	3000	1500	50

Data to be provided year-wise for next 3 years.

Annexure-V: Blended Learning

Blended Learning Estimated Ratio &Recommended Tools: NA

Annexure-VI: Standalone NOS- Performance Criteria details

1. **Description:**

   This course is framed to facilitate skill development in IoT sector focusing on students/unemployed youth at Diploma, Engineering graduates, etc. to increase their employability to work in IoT hardware and software related fields. To upgrade the skills of people already in work in IoT and other allied areas of this technology. Purpose is to demystify IoT and equip the future workforce with the confidence to learn and apply skills independently.

2. **Scope:**

   The scope covers the following:

   - Enhances career prospects by preparing individuals for roles in IoT development, IoT systems engineering, and IoT solution architecture.
   - Equips participants with the skills to design, deploy, and manage IoT systems, making them valuable assets in industries utilizing connected devices and smart technologies.
   - Extends to opportunities in sensor networks, edge computing, smart infrastructure, and other advanced fields that require proficiency in IoT technologies.

3. Elements and Performance Criteria:

Elements	Performance Criteria
Understand IoT Architecture, Components, and Hardware Platforms	**PC1.** Explain the IoT architecture including physical and logical design, and enabling technologies. **PC2**. Identify different IoT components such as sensors, actuators, hardware platforms, and connectivity solutions. **PC3**. Describe the types of sensors, their working principles, specifications, and interfaces of IoT hardware platforms like Arduino and Raspberry Pi.
Develop IoT Applications Using Microcontrollers and Embedded Programming	**PC4**. Install and use the Arduino IDE for programming, and interface various sensors and modules with Arduino. **PC5**. Demonstrate programming and hardware interfacing on Raspberry Pi using Python. **PC6.** Build basic IoT applications by integrating sensors, modules, and devices with microcontrollers like NodeMCU and ESP32.
Implement IoT Networking Protocols and Cloud Integration	**PC7.** Explain networking fundamentals and wireless protocols (RF, Bluetooth, RFID, Wi-Fi, BLE, LoRa, NB-IoT) used in IoT applications. **PC8**. Use MQTT protocol for IoT communication and implement a basic web server for data visualization. **PC9**. Connect IoT devices to cloud platforms for data and device management, and demonstrate simple app development for IoT control or monitoring.

4. Knowledge and Understanding (KU):

The individual on the job needs to know and understand:

KU1: Fundamental principles of IoT, including device connectivity, communication protocols, and data management.

KU2: Proficiency in using IoT-specific libraries and frameworks, such as MQTT for communication and data analytics tools for insights.

KU3: Techniques for integrating and managing various IoT devices and sensors, including understanding of edge computing and cloud-based solutions.

KU4: Theoretical and practical knowledge required to address challenges in IoT projects, including scalability, security, and system reliability.

5. Generic Skills (GS):

User/individual on the job needs to know how to:

GS1: Follow instructions, guidelines, and procedures related to IoT project development and device management.

GS2: Communicate complex IoT concepts and system configurations effectively to both technical and non-technical stakeholders.

GS3: Apply problem-solving skills and critical thinking to address challenges in IoT deployment and optimize system performance.

Annexure-VII: Assessment Criteria

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

Elements	Assessment Criteria for Performance Criteria	Theory Marks	Practical Marks
Understand IoT Architecture, Components, and Hardware Platforms	PC1. Explain the IoT architecture including physical and logical design, and enabling technologies. PC2. Identify different IoT components such as sensors, actuators, hardware platforms, and connectivity solutions. PC3. Describe the types of sensors, their working principles, specifications, and interfaces of IoT hardware platforms like Arduino and Raspberry Pi.	35	5
Develop IoT Applications Using Microcontrollers and Embedded Programming	PC4. Install and use the Arduino IDE for programming, and interface various sensors and modules with Arduino. PC5. Demonstrate programming and hardware interfacing on Raspberry Pi using Python. PC6. Build basic IoT applications by integrating sensors, modules, and devices with microcontrollers like NodeMCU and ESP32.	35	10
Implement IoT Networking Protocols and Cloud Integration	PC7. Explain networking fundamentals and wireless protocols (RF, Bluetooth, RFID, Wi-Fi, BLE, LoRa, NB-IoT) used in IoT applications.	30	10

	PC8. Use MQTT protocol for IoT communication and implement a basic web server for data visualization. PC9. Connect IoT devices to cloud platforms for data and device management, and demonstrate simple app development for IoT control or monitoring.		
	Total Marks	**100**	**25**
	Grand Total	**125**	

Annexure-VIII: 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.

Assessment of the qualification evaluates candidates to ascertain that they can integrate knowledge, skills and values for carrying out relevant tasks as per the defined learning outcomes and assessment criteria.

The underlying principle of assessment is fairness and transparency. The evidence of the outcomes and assessment criteria. competence acquired by the candidate can be obtained by conducting Theory (Online) examination.

About Examination Pattern:

1. The question papers for the theory exams are set by the Examination wing (assessor) of NIELIT HQS.
2. The assessor assigns roll number.
3. The assessor carries out theory online assessments. Theory examination would be conducted online and the paper comprise of MCQ
4. Pass percentage would be 50% marks.
5. The examination will be conducted in English language only.

Quality assurance activities: A pool of questions is created by a subject matter expert and moderated by other SME. Test rules are set beforehand. Random set of questions which are according to syllabus appears which may differ from candidate to candidate. Confidentiality and impartiality are maintained during all the examination and evaluation processes.

Annexure-IX: 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
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.