QUALIFICATION FILE – Standalone NOS

Introduction to IoT Application Development for Agriculture

☐ 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: 3.5

Submitted By:

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Section 1: Basic Details

1.	**NOS-Qualification Name**	**Introduction to IoT Application Development for Agriculture**	
2.	**Sector/s**	**Electronics**	
3.	**Type of Qualification ☒ New ☐ Revised**	**NQR Code & version of the existing /previous qualification:** NA	**Qualification Name of the existing/previous version:** NA
4.	**National Qualification Register (NQR) Code & Version**	NG-3.5-EH-02639-2024-V1-NIELIT	**5. NCrF/NSQF Level: 3.5**
6.	**Brief Description of the Standalone NOS**	The upskilling program IoT Application Development for Agriculture has been designed in collaboration with GROK Learning Pvt Ltd. enable students to learn how to apply concepts to solve real-life agriculture industry problems. Students will dive into the essentials of sensor technology and communication protocols, essential for modern agriculture. Students will learn to build industry solutions for the Agriculture Industry such as: ● Smart Agriculture using Moisture Sensor and Pump ● Smart Agriculture using Moisture Sensor, Solenoid and RTC ● Smart Rain Detection and Foodgrain Protection ● Smart Fence to Protect Crops ● Water Management for Rural Areas ● Scalable Irrigation using LoRa Protocol ● Sustainable Farming using Hydroponics This program is conducted with the help of cloud based IoT infrastructure which eliminates the need for experienced industry experts. Cloud based IoT infrastructure comprising of: - Circuit building software to assemble and connect all components required for the application. - No-code block programming software tools to connect visual building blocks in a logical way. - Python Direct IDE - Content Knowledge base modules - Cloud based remote IoT application management using mobile interface.	

<table>
<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>1st year of 3-year diploma after 10th in Electronics and Commutation Engineering/ Electrical Engineering/ Computer Science/ Information Technology/ allied branches</td><td>NA</td></tr>
<tr><td>2</td><td>11 or equivalent</td><td>NA</td></tr>
<tr><td>3</td><td>10th grade pass and pursuing continuous schooling</td><td>NA</td></tr>
<tr><td>4</td><td>8th grade pass with two years of NTC plus 1 year NAC/CITS</td><td>NA</td></tr>
<tr><td>5</td><td>NSQF Level 3 in Electronics and Commutation Engineering/ Electrical Engineering/ Computer Science/ Information Technology/ allied branches with</td><td>1.5 year relevant experience</td></tr>
</table>
b. Age: 18 years</td></tr>
<tr><td>8.</td><td>Credits Assigned to this NOS-Qualification, Subject to Assessment (as per National Credit Framework (NCrF))</td><td>2 Credits</td><td>9. Common Cost Norm Category (I/II/III) (wherever applicable):
Category I(Electronics System Design)</td></tr>
<tr><td>10.</td><td>Any Licensing Requirements for Undertaking Training on This Qualification (wherever applicable)</td><td colspan="2">The open source resources can be used.
Annual subscription-based license to access IoT based cloud infrastructure may also be purchased.</td></tr>
</table>

<table>
<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>☒ Offline ☐ Online ☐ 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>15</td><td>45</td><td>60</td></tr></table>
The mode of delivery shall be based on the regional demand and can be offered in any of the above modes mentioned.</td></tr>
<tr><td>12.</td><td>Assessment Criteria</td><td><table><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><tr><td>100</td><td>60</td><td>20</td><td>20</td><td>200</td><td>50</td></tr></table>
The centralised online assessment is conducted by the Examination Wing, NIELIT Headquarters.</td></tr>
<tr><td>13.</td><td>Is the NOS Amenable to Persons with Disability</td><td>☒ Yes ☐ No
If “Yes”, specify applicable type of Disability:

a. Locomotor Disability: Leprosy Cured Person, Dwarfism, Muscular Dystrophy and Acid Attack Victims
b. Visual Impairment: Low Vision</td></tr>
<tr><td>14.</td><td>Progression Path After Attaining the Qualification, wherever applicable</td><td>IoT Engineer</td></tr>
<tr><td>15.</td><td>How will the participation of women be encouraged?</td><td>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>
<tr><td>16.</td><td>Other Indian languages in which the Qualification & Model Curriculum are being submitted</td><td>Qualification files available in English & Hindi Language.</td></tr>
<tr><td>17.</td><td>Is similar NOS available on NQR-if yes, justification for this qualification</td><td>☐Yes ☒ No</td></tr>
</table>

18.	**Name and Contact Details Submitting / Awarding Body SPOC** *(In the case of CS or MS, provide details of both Lead AB & Supporting ABs)*	**From NIELIT** Name: Saket Saurabh Email: srv.saket@nielit.gov.in Contact No:011-25308300 Website: https://nielit.gov.in/ **From GROK** Name: Grok Learning Email: enquiry@grokstem.com	
19.	**Final Approval Date by NSQC: 30-05-2024**	**20. Validity Duration: 3 years**	**21. Next Review Date:30-05-2027**

Section 2: Training Related

1.	**Trainer's Qualification and experience in the relevant sector (in years) (as per NCVET guidelines)**	B.E./B.Tech in Electrical/Electronics/IT/Comp. Sc. With 2 Years of relevant Experience and 1 year training/assessment experience. Diploma in Electrical/Electronics/IT/Comp.Sc. With 3 Years of relevant Experience and 2 year training/assessment experience.
2.	**Master Trainer's Qualification and experience in the relevant sector (in years) (as per NCVET guidelines)**	B.E./B.Tech in Electrical/Electronics/IT/Comp. Sc. With 3 Years of relevant Experience and 1 year training/assessment experience.
3.	**Tools and Equipment Required for the Training**	☒ Yes ☐No Available at Annexure-II
4.	**In Case of Revised NOS, details of Any Up-skilling Required for Trainer**	Not Applicable

Section 3: Assessment Related

1.	**Assessor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	The assessor carries out theory online assessments through the remote proctoring methodology. Theory examination would be conducted online and the paper comprises 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.
2.	**Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines), (wherever applicable)*	
3.	**Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	External Examiners/ Observers (Subject matter experts) are deployed including NIELIT scientific officers who are subject experts for evaluation of Practical examination/ internal assessment / Project/ Presentation/ assignment and Major Project (if applicable). Qualification is generally B.Tech in Electrical/Electronics/IT/Comp. Sc. With 2 Years of relevant Experience and 1 year training/assessment experience.
4.	**Assessment Mode***(Specify the assessment mode)*	Centralized online examination will be conducted
5.	**Tools and Equipment Required for Assessment**	Same as for training ☒ Yes ☐ No

Section 4: Evidence of the Need for the Standalone NOS

1.	**Government /Industry initiatives/ requirement (Yes/No):** Yes.
2.	**Number of Industry validation provided**: 15
3.	**Estimated number of people to be trained**: 1000 persons per year shall be trained.
4.	**Evidence of Concurrence/Consultation with Line Ministry/State Departments:** 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:** Industry Validation	*Available at* Annexure-III: Industry Validation
4.	**Annexure:** Training Details	*Available at* Annexure-IV: Training Details
5.	**Annexure:** Blended Learning *(Mandatory, in case the selected Mode of delivery is Blended Learning)*	*Available at* Annexure-V: Blended Learning
6.	**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: Performance Criteria
7.	**Annexure:** Performance and Assessment Criteria *(Mandatory)*	*Available at* Annexure-VII: Detailed Assessment Criteria
8.	**Annexure:** Assessment Strategy *(Mandatory)*	*Available at* Annexure-VIII: Assessment Strategy
9.	**Annexure:** Acronym and Glossary *(Optional)*	*Available at* Annexure-IX: Acronym and Glossary
10.	**Supporting Document:** Model Curriculum	*Available at* Annexure-C: 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	Upon completion of IoT Application Development for Agriculture Industry course individuals gain the confidence to create their own original, cutting-edge solutions for the agriculture sector by learning how to build the applications that are already available as prototypes and address real Agriculture industry challenges. Graduating students will be equipped to take advantage of the Internet of Things and use it to advance their careers and open up new opportunities with entrepreneurial ability to launch their own Agricultural IoT-based business service.	An efficient IoT expert with cloud computing knowledge and having variety of skillsets required to solve real world Agriculture industry problems	3.5
Professional and Technical Skills/ Expertise/ Professional Knowledge	Effectively apply concepts to build solutions for IoT verticals like Smart Agriculture. Develop new use case to address a real-life Agriculture industry problem.	Individuals completing this qualification are likely to possess the expertise required for roles in the field of IoT Agriculture Industry Development Applications	3.5
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	When people have the right professional skills, they can excel in their roles, adapt to changing industry demands, and contribute effectively to organizations leveraging cloud technologies. Ability to transform ideas into real-life Agriculture industry problem solutions using technological tools. Entrepreneurial ability to launch their own IoT based business service.	After completing this program students will be in a better position to fulfill expectations from industry that offers unique opportunities for career development in this exciting field.	3.5
Broad Learning Outcomes/ Core Skill	Individuals with cloud-based Internet of Things skillset will contribute to organizational success and take up roles in the evolving landscape of Smart Agriculture.	This program prepares the candidates to adapt to current Agriculture industry demands.	3.5
Responsibility	Able to design new IoT applications for different industry verticals and able to manage and maintain existing IoT Agriculture industry problem solutions.	Takes complete responsibility for delivery and quality of own work and output as also the subordinates. Shares responsibility for the group tasks.	3.5

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 (750Sq. ft to 1000 Sq. ft.)	30
2	Students Chair	30	30
3	Students Table	15 (2 students sharing 1 table)	15
4	Desktop computer with accessories / Laptop	Laptop with minimum specifications: Intel I3 or Celeron processor with at least 8GB RAM, 512GB SSD Hard disk integrated with graphics card, Display size 15.6-inch, Wi-Fi connectivity and Wired Optical Mouse.	15
5	Cloud Based IoT Infrastructure	Complete stack comprising of circuit building software, no-code block level programming software, Python editor and knowledge-based modules on Agriculture IoT content with web application management interface using cloud based IoT services.	Should support multiple concurrent logins.
6	Hardware	Microprocessors and Sensors like Ultrasonic Sensor, Camera, Soil Moisture Sensor, Raindrop Sensor and Components Such as Servo Motor, LoRa Hub, LoRa Sensor, LoRa Switch, Water Pump, DC Motor, Limit Switches, LED Module, Buzzer.	15
7	Cloud connected working industry applications	Agriculture IoT working application prototypes. -Smart Agriculture using Moisture Sensor and Pump -Smart Agriculture using Moisture Sensor, Solenoid and RTC -Smart Rain Detection and Foodgrain Protection -Smart Fence to Protect Crops -Water Management for Rural Areas -Scalable Irrigation using LoRa Protocol -Sustainable Farming using Hydroponics	6

8	Internet Connectivity	Seamless internet with at least 100Mbps without firewall	

Classroom Aids for offline and blended mode of training:

The aids required to conduct sessions in the classroom are:

1. **LCD Projector/Smart Board**

Annexure III: Industry Validations/ Government Recognition Summary

S. No	Organization Name	Representative Name	Designation	Contact Address	Contact Phone No	E-mail ID
1	AISECT Ltd.	Teena Panthi	Assistant Manager	AISECT Ltd. 1-1-387, 3rd Floor, Flat no. 403/404, GNR heights, Above SBI, Bakaram Road, Musheerabad, Hyderabad-500020	7879982075	teena.panthi@aisect.org
2	Aprajita International	Anamika Kukreja	Director	Khasra No. 225, Shed No. 1, Village Dhalwala, Tehri Garhwal (UK)	8266058917	sanjay@rohinclothing.com
3	B. G. Infotech	Amal Das	Centre Head	Kakdihi, Mecheda, Purba Mednipur	9434996748	Bginfotech2007@gmail.com
4	L&T Skill Trainers Academy	B A Damahe	Head L&T STA	Madh Campus Near Custom House, Versova Creek Madh Jetty Madh, Mumbai-400061, India	9833078355	bhuvan.damahe@larsentoubro.com
5	M/S.Peleecon Linkers	MILIND R.HEBLI	PROPRIETOR	213,"Krishna",Laxmi Industrial Complex,Pokhran Road No.1,Vartaknagar, THANE – 400 606.	98200 95454	milindhebli66@gmail.com
6	Process Precision	Jay Jain	Business	101 Diamond Industrial Estate,		

	Instruments		Development Head	Navghar, Vasai Road (E), Palghar-401210, Maharashtra	9930880079	jayjain@ppiindia.net
7	PRO PLATERS LLP	Rajesh Dattaram Kesarkar	Partner	PLOT NO. 5, SHIRODA INDUSTRIAL ESTATE, SHIRODA GOA-403103	9922897176	-
8	BAPL ROTOTECH PVT LTD	Santosh Sharma	Sr. Vice President	Plot 186-B, Industrial Growth Centre, Sector 1 Pithampur, Dhar, Madhya Pradesh-454775	840886301	sharma@baplrototech.com
9	The Supreme Industries Ltd.	Sudhir Kanvinde	Chief Information Officer (CIO)	1141, 1142 Solitaire Corporate, Chakala, Andheri (East), Mumbai 400093	9167233494	kanvinde@supreme.co.in
10	Prasanthi Polytechnic	D. Prasad	Principal	Duppituru (Vill), Atchutapuram (Md), Visakhapatnam (Dist), Andhra pradesh - 531011.	9849952573	Prasadreddy.1279@gmail.com
11	Predulive Innovations Pvt. Ltd	Shivanshu Dwivedi	Founder & MD	1596, Avas Vikas Colony Gandhinagar Basti, Uttar Pradesh – 272001	9918443373	shivanshu@predulivelabs.in
12	JAN SAMRIDHI DUMKA	Gobind Nath Maji	Director	Near Gyan Mandir School, Dudhani, Dumka, Jharkhand-814101	8789620133	Gobind107@gmail.com
13	Sidhi Vinayak Academy	Neha Verma	Director	Shiv Narayan Kunj, B block, Shivaji Nagar, Hethu, Ranchi (JH)-834002	8789837772	info.sidhiacadmey@gmail.com
14	Surekha IT Services	Anjani K	Manager	8-3-191/84/302, Sharan Residency, Vengalrao Nagar, HyderabaD-500038	8125134134	info@surekhaitservices.com
15	Aajivika Global Skill Private Limited	Mukesh Kumar	Director	Beside Vishal Trade, dasmile Chowk, Khunti Road, Ranchi (Jharkhand)-835221	95079522882	aajivikaglobal@gmail.com

Annexure IV: Training Details

Training Projections:

Year	Estimated Training # of Total Candidates	Estimated training# of Women	Estimated training# of People with Disability
2024-25	1000	200	20
2025-26	1000	200	20
2026-27	1000	200	20

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

Annexure V: Blended Learning

Blended Learning Estimated Ratio & Recommended Tools:

Refer NCVET "Guidelines for Blended Learning for Vocational Education, Training & Skilling" available on:

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	Online interaction platforms like Zoom, Google Meet	00:100
2	Imparting Soft Skills, Life Skills and Employability Skills /Mentorship to Learners	NA	NA
3	Showing Practical Demonstrations to the learners	Online interaction platforms like Zoom, Google Meet	00:100
4	Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	PCs/Laptops, Internet, Cloud based IoT infrastructure using circuit building software, no-code block level programming software, Python direct IDE, knowledge-based modules on IoT content with mobile interface for cloud based remote management of Agriculture Industry IoT applications	50:50
5	Tutorials/ Assignments/ Drill/ Practice	Online interaction platforms like Zoom,	00:100

		Google Meet	
6	Proctored Monitoring/ Assessment/ Evaluation/ Examinations	Examination	50:50
7	On the Job Training (OJT)/ Project Work Internship/ Candidate Training	Build and demonstrate a new Agriculture Industry IoT solution to solve real-life agriculture industry problems.	100:00

Annexure VI: Standalone NOS- Performance Criteria details

1. Description:

The Standalone NOS equips students with skills in electronics, software, problem-solving, and entrepreneurship for the evolving Agricultural IoT industry.

2. Scope:

The scope covers the following:

The NOS entails immersive learning experiences in electronics and software skills, emphasizing practical applications of sensor principles, microcontroller utilization, communication protocols, and seamless integration of cloud computing. Through hands-on activities and projects, students will gain proficiency in developing sophisticated IoT solutions for agriculture. By mastering these essential concepts and techniques, students will be well-equipped to address the evolving demands of the industry and contribute effectively to the advancement of smart agriculture.

3. Elements and Performance Criteria

Advanced Skills for Deploying and Managing Agricultural IoT Solutions

To be competent, the user/individual on the job must be able to:

PC1. Ability to select suitable communication protocols (e.g., LoRaWAN, USB, Bluetooth) for specific Agricultural IoT applications:

- Understanding the requirements and constraints of agricultural environments to choose the most appropriate communication protocol for data transmission, considering factors like range, power consumption, and data rate.

PC2. Knowledge of Cloud-based IoT services supporting MQTT protocol:

- Acquiring familiarity with cloud platforms that support MQTT (Message Queuing Telemetry Transport) protocol, enabling seamless integration of IoT devices with cloud infrastructure for data storage, analysis, and remote management in agricultural settings.

PC3. Capacity to develop industry-specific solutions addressing real challenges in Agriculture:

- Demonstrating the ability to identify and address specific challenges faced in agriculture through the development of IoT solutions, such as precision farming, crop monitoring, and livestock management, to improve productivity, sustainability, and resource efficiency.

PC4. Strong analytical abilities and troubleshooting skills for IoT-related technical issues:

- Possessing analytical skills to diagnose and troubleshoot technical problems that may arise in the deployment and management of agricultural IoT solutions, ensuring reliable operation and timely resolution of issues to minimize downtime and optimize performance.

PC5. Proficiency in utilizing web and mobile interfaces for IoT solution execution and monitoring:

- Mastering the use of web and mobile interfaces to interact with and monitor IoT solutions deployed in agricultural environments, allowing for remote management, real-time data visualization, and informed decision-making for farmers and stakeholders.

Programming Proficiency for Agricultural IoT Development:

PC6. Proficiency in writing application programs using no-code block programming software tools:

- Developing proficiency in using no-code block programming software tools to create application programs for agricultural IoT solutions, enabling rapid prototyping, iteration, and customization without the need for extensive coding expertise.

PC7. Acquisition of working knowledge in programming languages such as Python:

- Gaining a working knowledge of programming languages like Python, essential for developing custom software components and scripts to enhance the functionality and intelligence of agricultural IoT applications, including data analysis, predictive modeling, and automation.

Foundational Skills in Agricultural IoT:

PC8. Understanding the necessity of Agricultural IoT:

- Recognizing the importance and relevance of Agricultural IoT in addressing critical challenges faced by the agriculture industry, such as increasing food demand, climate change, resource scarcity, and sustainability, by leveraging advanced technologies for data-driven decision-making and precision agriculture.

PC9. Familiarity with essential building blocks of IoT applications:

- Understanding the fundamental components and principles of IoT applications in agriculture, including sensor technologies, communication protocols, data management techniques, and cloud integration, to design and deploy robust and scalable solutions tailored to agricultural needs.

PC10. Identification of necessary sensors and components for Agricultural Industry, such as Climate Sensor, IR Sensor, Motion Sensor, etc., and proficiency in designing functional circuits using circuit building software:

- Identifying the appropriate sensors and components required for specific agricultural applications, such as climate monitoring, pest detection, and soil analysis, and designing functional circuits using circuit building software to integrate these sensors into IoT systems effectively, ensuring accurate data collection and actionable insights for farmers.

4. Knowledge and Understanding (KU):

KU1. Understanding the impact of IoT:

- Appreciating the transformative impact of IoT technology across industries and specifically in agriculture, including its potential to optimize processes, improve efficiency, increase productivity, and enable sustainable practices through data-driven insights and automation.

KU2. Hands-On experience in IoT Application Development:

- Gaining practical experience in the development of IoT applications, from conceptualization and design to implementation and deployment, through hands-on projects and experimentation with IoT hardware, software, and platforms.

KU3. Knowledge of Electronics Fundamentals and Sensor Technology:

- Developing a comprehensive understanding of electronics fundamentals and sensor technology, including circuitry, analog and digital signals, sensor characteristics, and measurement techniques, essential for designing and implementing IoT systems in agricultural environments.

KU4. Familiarity with IoT Communication Protocols and Microcontrollers:

- Acquiring familiarity with a range of IoT communication protocols and microcontroller platforms commonly used in agricultural IoT applications, understanding their functionalities, advantages, and limitations, and selecting the most suitable options based on application requirements and constraints.

KU5. Understanding Programming and Software Stack for IoT:

- Understanding the programming languages, software architectures, and development frameworks relevant to IoT applications in agriculture, enabling the development and integration of software components for data processing, analysis, and interaction with connected devices and services in agricultural IoT systems.

5. Generic Skills (GS):

GS1. Problem-solving: Enhancing problem-solving abilities to identify, analyze, and address challenges encountered in agricultural IoT development, employing systematic approaches and critical thinking skills to optimize solutions and achieve desired outcomes.

GS2. Technical Proficiency: Gaining practical skills in electronics, programming, and cloud computing essential for navigating the technical complexities of agricultural IoT development, enabling effective design, implementation, and management of IoT systems tailored to agricultural needs.

GS3. Innovation: Fostering creativity and innovative thinking to devise novel solutions for real-world challenges in agriculture, leveraging IoT technologies to improve farming practices, enhance crop yield and quality, and promote sustainability and resilience in agricultural systems.

GS4. Project Management: Developing project management competencies to plan, execute, and evaluate agricultural IoT projects effectively, considering factors such as regulatory compliance, security and privacy requirements, and interoperability with existing agricultural systems and standards.

GS5. Communication: Improving communication skills to convey complex concepts, ideas, and project requirements effectively to diverse stakeholders in the agriculture industry, including farmers, agronomists, researchers, policymakers, and technology providers, fostering collaboration and facilitating the adoption of IoT solutions to address agricultural challenges.

Annexure VII: Assessment Criteria

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

NOS/Module Name	Assessment Criteria for Performance Criteria	Theory Marks	Practical Marks	Project Marks	Viva/ Internal Assessment (Marks)
Introduction to IoT Application Development for Agriculture **NOS Code: NIE/ELE/N0518**	*Advanced Skills for Deploying and Managing Agricultural IoT Solutions*	**20**	**20**	**20**	**-**
	PC1. Ability to select suitable communication protocols (e.g., LoRaWAN, USB, Bluetooth) for specific Agricultural IoT applications.	-	-	-	-
	PC2. Acquire knowledge about Cloud-based IoT services supporting MQTT protocol.	-	-	-	-
	PC3. Capacity to develop industry-specific solutions addressing real challenges in Agriculture.	-	-	-	-

	PC4. Strong analytical abilities and troubleshooting skills for IoT-related technical issues.	-	-	-	-
	PC5. Proficiency in utilizing web and mobile interfaces for IoT solution execution and monitoring.	-	-	-	-
	Programming Proficiency for Agricultural IoT Development	**30**	**40**	**-**	**-**
	PC6. Write application programs using no-code block programming software tools.	-	-	-	-
	PC7. Acquire working knowledge of programming languages like python.	-	-	-	-
	Foundational Skills in Agricultural IoT	**50**		**-**	**20**
	PC8. Understand the need for Agricultural IoT	-	-	-	-
	PC9. Familiarity with essential building blocks of IoT applications.	-	-	-	-
	PC10. Identification of necessary sensors and components for Agricultural Industry, such as Climate Sensor, IR Sensor, Motion Sensor, etc., and proficiency in designing functional circuits using circuit building software:	-	-	-	-
		100	**60**	**20**	**20**
	Total Marks	**200**			

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 and Practical examinations.

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 the roll number.
3. The assessor carries out theory assessments. Theory examination would be conducted online, and the paper comprise of MCQ.
4. The assessor carries out practical assessments. Practical examination would be conducted 100% offline creating own 3D Printed solutions and successful demonstration of the same.
5. Pass percentage would be 50% marks.
6. 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.