

QUALIFICATION FILE – CONTACT DETAILS OF SUBMITTING BODY

Name and address of submitting body:

- NIELIT Gorakhpur,
M.M.M.U.T. Campus, Deoria Road Gorakhpur – 273010 (UP)
Phone No.: 0551-2273371
Branch Office
- NIELIT Lucknow
A-1/9, Sumit Complex, VibhutiKhand, Gomti Nagar, Lucknow- 226010(UP)
Phone No.: 0522 272 0590

Name and Contact Details of Individual Dealing with the Submission

Name: PawanVerma

Position in the organisation Technical officer

Address if different from above: NA

Tel number(s) 0522 2720590

E-mail address pawanverma@nielit.gov.in

List of documents submitted in support of the Qualifications File

1. Detailed Curriculum
2. Industry Validation (Attached at Annexure I)

QUALIFICATION FILE SUMMARY

Qualification Title	Certificate course in Arduino based Embedded System Design
Qualification Code	NIELIT/ES/6/42
Body/Bodies which will Assess Candidates	Examination Cell, National Institute of Electronics and Information Technology, 6-CGO Complex, Electronics Niketan, Lodhi Road, New Delhi. 110003.
Body/Bodies which will Award the Certificate for the Qualification.	Certification Division, National Institute of Electronics and Information Technology, 6-CGO Complex, Electronics Niketan, Lodhi Road, New Delhi. 110003.
Body which will Accredit Providers to offer the Qualification.	Accreditation Division, National Institute of Electronics and Information Technology, 6-CGO Complex, Electronics Niketan, Lodhi Road, New Delhi. 110003.
Occupation(s) to which the Qualification Gives Access	Specialized in Embedded system Design using Arduino
Proposed Level of the Qualification in the NSQF.	Level 4
Notional Learning Hours	300 Hours. (3 Month Full Time)
Entry Requirements / Recommendations.	<ul style="list-style-type: none"> • Diploma in Electronics/Electronics & Communication/Electrical/Electrical & Electronics/Instrumentation/ Biomedical /Computer Science/Information Technology • BSc in Electronics/ Instrumentation/Computer Science/Information Technology.
Progression From the Qualification.	Embedded System Specialist ↓ Specialist in Arduino based Embedded System Design ↓ Embedded System Engineer
Planned Arrangements for RPL.	<ul style="list-style-type: none"> • Presently only candidates who undergo training shall be assessed. • It will be incorporated once RPL strategy is finalized

Formal Structure of the Qualification				
Module Code	Title of Unit or other Component (include any identification code used)	Mandatory / Optional	Estimated Size (Learning Hours)	Level
CES-01	Embedded System Design: Basics	Mandatory	50	4
CES-02	Learning Arduino Platform	Mandatory	50	
CES-03	The Basics of Sensors and Actuators using Arduino	Mandatory	60	
CES-04	Controlling Embedded System Based Devices using Arduino	Mandatory	60	
CES-05	Project: based on Embedded System Design using Arduino Board	Mandatory	60	
CES-06	Enhancing Communication & Soft Skill	Mandatory	20	

Please Attach any Document giving Further Detail about the Structure of the Qualification – e.g. a Curriculum or Qualification Pack. Detailed Curriculum:

SECTION 1 **ASSESSMENT**

Name of Assessment Body:

Examination Cell

National Institute of Electronics and Information Technology
6-CGO Complex, Electronics Niketan,
Lodhi Road, New Delhi. 110003.

Will the Assessment Body be Responsible for RPL Assessment?

Yes. We will conduct Online/Entrance Test/Interview of the Participants for Admission. Entrance test will be based on Aptitude (20%), Logical reasoning (20%), C Language (20%) and Basic electronics (40%) Basic Electronics includes topics of Digital, Analog, Microprocessor/Microcontroller, Computer Organization, Signals and Systems. At the course end, we will conduct Theory and Practical Examination for each module except the Final Module of Project Work.

Finally, Project Work will be assessed by oral presentation and live demo of project to be given by candidates. Certificates will be awarded to only successful Candidates.

Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, consistent and fair and show that these are in line with the requirements of the NSQF:

The emphasis is on practical demonstration of skills & knowledge based on the performance criteria. Each OUTCOME is assessed & marked separately. Student is required to pass in all OUTCOMES individually and marks are allotted.

Following assessment methodologies are used.

- A. Written Assessment (MCQ-Type – Online Examination)
- B. Practical Assessment
- C. Presentation & Viva Voce Assessment

Assessment Evidences

1. The assessor collects a copy of the attendance for the training done under the scheme. The attendance sheets are signed and stamped by the Examination Superintendent/ Head of Institution.
2. The assessor verifies the authenticity of the candidate by checking the photo ID card/Hall Ticket issued by the institute as well as any one Photo ID card issued by the Central/Government. The same is mentioned in the attendance sheet.
3. The Registration/Examination Division assigns roll number.
4. The assessor takes photograph of all the students along with the assessor standing in the middle and with the centre name/banner at the back as evidence.

**Please attach any documents giving further information about assessment and/or RPL.
ASSESSMENT EVIDENCE**

Complete the following grid for each grouping of NOS, assessment unit or other component as listed in the entry on the structure of the qualification on page 1.

Job Role Specialized Embedded System Engineer

Title of Unit/Component:

(Detailed Curriculum attached As Annexure-III)

Assessable Outcomes	Assessment criteria for the outcome	Total Mark	Written	Practical	Internal/ Viva-voce
1. To familiarize with Embedded System Design	Develop Concept of Embedded System Components	100	10	5	5
	Identify Embedded System Classifications and Components		15	10	10
	Learn how to use Processors and other Elements of Embedded System		15	5	5
	Use of Embedded System's Software and its applications		10	5	5
		Total	50	25	25
2 Explain and practice of Arduino Platform	Practice of Programming Microcontroller	100	5	5	5
	Recognize Arduino Board and its component		5	5	5
	Create Arduino Standard Library		10	5	5
	Create Arduino Development Environment		15	5	5
	Use concepts for writing Arduino Sketches		15	5	5
		Total	50	25	25
3 Develop Basic Concept of	How to Connect and Work With different sensors such as: Humidity, Heat/Temperature, proximity, IR	100	30	15	15

Sensors and Actuators	Motion, Accelerometer, Sound , Light, distance, Pressure, Thermal, Infrared, LDR etc. to Arudino Board				
	Reading Various Sensor data on Serial Monitor and LCD Display		10	5	5
	Explain Functioning of Actuators		10	5	5
		Total	50	25	25
4 Learn and Practice Controlling of Embedded System Based Devices using Arduino	Reading Data from Analog and Digital Sensors on Serial Monitor/LCD monitor	100	10	5	5
	Work With LED controlled by Switch/Potentiometer, 7 Segment LED Display/Control		20	10	10
	How To Connect Relays and Servomotors to Arduino Board And Work With 5V/3V Power Supply using voltage regulator ICs(7805/7803)		20	10	10
		Total	50	25	25
5 Practical Project: based on Embedded System Design using Arduino Board	Project Based on, <ul style="list-style-type: none"> Analog/digital input using POT Electronic Voting Machine using LCD Serial Display Fire Detection Module Smart Class Room Smart Street Light Prototype Agriculture (Using Humidity/ Temperature Sensors) 	150	150		
		Total	150		
6 Enhancing Communication & Soft Skill	Develop Communication Skill	50	10	NA	NA
	Managing career, staff and professional relationships		20	NA	NA
	Ready for interview		20	NA	NA
		Total	50	NA	NA
	Grand Total	600	350	125	125

Means of assessment 1

Proctored online assessments (LAN and Web based), carried out using a variety of question formats applicable for linear / adaptive methodologies; performance criteria being assessed via tests, simulations, and multiple choice questions etc.

SECTION 2

EVIDENCE OF NEED

What evidence is there that the qualification is needed?

Embedded Systems are everywhere. Every time you look at your watch, answer the phone, take a picture, or turn on the TV you are interacting with an embedded system. Embedded systems are also found in cars, airplanes, and robots. They far outnumber traditional computers (which also contain embedded processors) and it is estimated that there will be thousands of embedded devices per person by 2015 (Lisa Su, CTO Freescale Semiconductor, 2008). Learning to design and program embedded systems is a critical skill that is necessary for many industry and scientific jobs.

Embedded System designing is mastering of designing, interfacing, configuring, and programming embedded systems. Arduino platform, which is an inexpensive, popular embedded system used by hobbyists, researchers, and in industry, to implement the techniques is getting huge famous across the globe. Arduino is an open source system to allow rapid development and education without having to get out the soldering Iron for instance, the boards in general lack the protection circuits often required in industrial applications to protect the controller as well as many other potential safety and environmental considerations. The rapid growth in science and technology offers several advantages of using integrated circuits, microprocessors, microcontrollers, embedded chips, etc., in designing electrical and electronics projects and circuits by reducing their size, cost, and complexity.

Today embedded systems are replacing various systems that used to be designed with a set of complex electronic circuits. Usually the heart of the embedded system is a microcontroller. One example of a microcontroller is Arduino. Arduino is an open source based prototyping platform used to sense and control physical devices. Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Source:

http://www.theseus.fi/bitstream/handle/10024/108551/Thesis_EetuPekka_Kouhia_6_5_2016_KaKo_NiHy_Korjaukset_Final.pdf?sequence=1

<http://www.slideshare.net/TongXu520/report-on-arduino>

What is the estimated uptake of this qualification and what is the basis of this estimate?

Student uptake from Industry

What steps were taken to ensure that the qualification(s) does/do not duplicate already existing or planned qualifications in the NSQF?

As the understanding and adoption models of Qualification Packs (QPs) evolve in the industry and across its sub-sectors, we foresee consolidation of qualification packs as a natural progression. The Qualification does not

exist as per information available in public domain.

What arrangements are in place to monitor and review the qualification(s)? What data will be used and at what point will the qualification(s) be revised or updated?

The Qualification is to be monitored and reviewed every two years.

The following data will be used

1. Results of assessments
2. Employer feedback will be sought post-placement
3. Student feedbacks
4. Workshops and seminar for reviewing the qualifications
5. Industry Requirements
6. Consultation/ Tie-up with Industries or Expert for review of the Curriculum.

Please attach any documents giving further information about any of the topics above.

NIL

SECTION 3

SUMMARY EVIDENCE OF LEVEL

Level of qualification: 4

Summary of Direct Evidence:

Justify the NSQF level allocated to the QP by building upon the five descriptors of NSQF. Explain the reasons for allocating the level to the QP.

Generic NOS is/are linked to the overall authority attached to the job role.

Specialized in Embedded system Design using Arduino					
Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility	Level
<p>Requires a command of wide ranging specialized theoretical and practical skill involving variable routine and non-routine context.</p> <p>Justification</p> <ul style="list-style-type: none"> Industry specific Knowledge Base Development. 	<p>Wide ranging, factual and theoretical knowledge in broad context with in a field of work or study.</p> <p>Justification</p> <ul style="list-style-type: none"> Hardware-Software Co Design Study. Low Cost Product Design Study Full resource utilization skill development Skill to update Knowledge 	<p>Wide range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study.</p> <p>Justification</p> <ul style="list-style-type: none"> Problem Identification and Solution Good Communication skill Creative Ideas for Unique Embedded system Design using Arduino based Product Design. 	<p>Good logical and mathematical skill, understanding of social political and natural environment, good in collecting and organising information, communication and presentation skill</p> <p>Justification</p> <ul style="list-style-type: none"> Low Cost-Low Power Embedded system Design using Arduino Product Design. New ways to look to Embedded system Design using Arduino Product and its Design. 	<p>Responsibility for own work and development</p> <p>Justification</p> <ul style="list-style-type: none"> Design and provide solution in a conducive and Non-Conductive Environment. Individual and Team Responsibility in designing of product in a larger group 	4
4	4	4	4	4	

SECTION 4

EVIDENCE OF RECOGNITION OR PROGRESSION

What steps have been taken in the design of this or other qualifications to ensure that there is a clear path to other qualifications in this sector?

This qualification comprises of Technical, Analytic and Problem solving skills and can be linked to any qualification higher than this one, existing or to come.

IoT is a seamless connected network system of **embedded** objects/ devices, with identifiers, in which communication without any human intervention is possible using standard and interoperable communication protocols.

It has become critical to develop Embedded system Design using Arduino products specific to Indian needs and in doing so it has become critical to have specialised skill man power for Embedded system Design using Arduino

Please attach any documents giving further information about any of the topics above.

Sources:

Revised Draft policy on IoT by Min of Electronics & Information Technology,
Govt of India

SECTION 5

EVIDENCE OF INTERNATIONAL COMPARABILITY

List any comparisons which have been established

- <http://itu.edu/> ITU Offers Embedded Systems Design with Raspberry Pi and Arduino in Python and C
- <http://ucsc.cmb.ac.lk/> running course on Embedded System Design and development using Microcontroller Programming.
- www.coursera.org/learn/arduino-platform offers course on ArduinoPlatform and C Programming
- Jadavpur University(Kolkata)running course on Arduino

