NCVET Code
2022/EHW/NIELIT/05318

NSQF QUALIFICATION FILE
Approved in 16th NSQC meeting – NCVET- Dated: 24th February, 2022

QUALIFICATION FILE - CONTACT DETAILS OF THE SUBMITTING BODY
Name and address of submitting body:

NATIONAL INSTITUTE OF ELECTRONICS AND INFORMATION TECHNOLOGY

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

Dwarka, New Delhi-110077

Name and contact details of individual dealing with the submission

Name	**:**	Ankit Kumar
Position in the organization	**:**	Scientist-'B'
Address if different from above	**:**	NA
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List of documents submitted in support of the Qualifications File

Annexure 1: Detailed Curriculum and lesson plan of the course
Annexure 2: Evidence of Course requirement in the industry
Annexure 3: Evidence of Job requirement from the industry
Annexure 4: Evidence of validation from industries

Model Curriculum to be added which will include the following:

- Indicative list of tools/equipment to conduct the training

Attached in Annexure 5

- Trainers qualification

Attached in Annexure 6

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SUMMARY

1	**Qualification Title**	Foundation course in Embedded Application Development
2	**Qualification Code, if any**	Will be given by NCVET post-approval Sector: Electronics
3	**NCO code and occupation**	2152.9900 (Electronics Engineers, Other)
4	**Nature and purpose of the qualification (Please specify whether qualification is short term or long term)**	**Nature:** ❖ This Certificate Course is targeted for creating qualified professional in the field of Embedded domain, which will help in employment and Entrepreneur development of the qualifier ❖ This Qualification is aligned to Level 4 **Purpose:** ❖ To train the students to be ready for Embedded Hardware/Software Engineer Job. ❖ To upgrade the skills of people already in work in embedded other allied areas of this technology ❖ Entrepreneurship development.
5	**Body/bodies which will award the qualification**	National Institute of Electronics and Information Technology NIELIT Bhawan, Plot No. 3, PSP Pocket, Sector-8, Dwarka, New Delhi-110077
6	**Body which will accredit providers to offer courses leading to the qualification**	NIELIT
7	**Whether accreditation/affiliation norms are already in place or not, if applicable (if yes, attach a copy)**	The Handbook for TP accreditation norm is available at: https://www.nielit.gov.in/content/nsqf
8	**Occupation(s) to which the qualification gives access**	Embedded Firmware Developer , Embedded Software developer, Embedded Application

		Engineer
9	**Job description of the occupation**	. **Embedded Software Developer**: Design and implement software of embedded devices and systems from requirements to production and commercial deployment **Embedded Firmware Developer**: Designing and implementing software of embedded devices and systems. **Embedded Application Engineer**: Developing Embedded based applications
10	**Licensing requirements**	NA
11	**Statutory and Regulatory requirement of the relevant sector (documentary evidence to be provided)**	NA
12	**Level of the qualification in the NSQF**	Level 4
13	**Anticipated volume of training/learning required to complete the qualification**	90 Hours
14	**Indicative list of training tools required to deliver this qualification**	Attached in Annexure 5
15	**Entry requirements and/or recommendations and minimum age**	Final Year Polytechnic Diploma in Electronics /Electrical/ Instrumentation **or** 3rd semester B.E/B.Tech in Electronics/Electronics & Communication/ Electrical/ Electrical & Electronics/Instrumentation
16	**Progression from the qualification (Please show Professional and academic progression)**	**Professional:** Embedded System Developer -> Senior Embedded System Developer **Academic:** i) Horizontal Progression: Courses in the area of Embedded System

		Design, OS Porting, Embedded Real Time Operating System, IoT ii) Vertical Progression: PG Diploma in Embedded System Design, PG Diploma in Embedded Real Time Systems, M. Tech in Embedded Systems
17	**Arrangements for the Recognition of Prior learning (RPL)**	Candidates with 1 year of experience in the relevant field may apply directly for evaluation.
18	**International comparability Where known (research evidence to be provided)**	NA
19	**Date of planned review of the Qualification.**	After Every 5 years
20	**Formal structure of qualification**	

Module Code	Module Name	Mandatory/ Optional	Estimated Size (Learning Hours)	Level
ED401	Introduction to Embedded Systems	Mandatory	6	4
ED402	Embedded C	Mandatory	18	4
ED403	ARM /Cortex Introduction and Architecture	Mandatory	16	4
ED404	Programming ARM Cortex Peripherals (GPIO, Timers, Serial Port and Interrupts)	Mandatory	26	4
ED405	Interfacing external peripherals to ARM Based Microcontroller Board	Mandatory	13	4
ED406	Porting on ARM/Cortex	Mandatory	11	4

SECTION 1

ASSESSMENT

21	**Body/Bodies which will carry out assessment:** The Examination Wing National Institute of Electronics and Information Technology NIELIT Bhawan, Plot No. 3, PSP Pocket, Sector-8, Dwarka, New Delhi-110077
22	**How will RPL assessment be managed and who will carry it out?** RPL assessment will be done by Examination Wing, NIELIT. Candidates can register as direct candidate with NIELIT and apply for evaluation.
23	**Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, reliable 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. Student is required to pass in all OUTCOMEs individually and marks are allotted. The Following assessment methodologies are used. 1. Written Assessment (Multiple Choice Questions) 2. Practical Assessment & Assignments 3. Project The assessment results are backed by following evidences. 4. The theory assessment is carried in online remote proctored mode. 5. Proctors authenticate the candidate based on registration details, pre-test image captures and I-card in possession of the candidate. 6. 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.

	7. Practical examination/Internal Assessment/ Project/Presentation/Assignment would be evaluated internally.

24. ASSESSMENT EVIDENCE

Title of Unit/Component:

Outcomes to be assessed	Assessment Criteria for the outcome	Means of Assessment		
		Total Marks	Written	Practical
Embedded C	Understanding of C programming	20	20	0
	Writing Embedded C Programs for various applications	40	20	20
	Total	**60**	**40**	**20**
Programing with ARM Microcontroller	Acquire Knowledge of ARM Architectural Concepts	20	20	0
	Interfacing Peripherals with ARM Microcontrollers and Programming	40	20	20
	Total	**60**	**40**	**20**
Acquire skill in	Acquire the knowledge of stages in Porting, Bootloaders, Cross Compilation, Tools used for Porting	10	10	0

OS Poring on Embedded Platforms	Working with U-boot, Buildroot and Busybox	30	10	20
	Total	**40**	**20**	**20**
Internal Assessment		**20**		
Assignment		**20**		
Total Marks		**200**		

Means of assessment

S. No	Examination Pattern	Modules Covered	Duration in Minutes	Maximum Marks
1	Theory	1-6	90	100
3	Practical	2-6	180	60
4	Internal Assessment	1-6	-	20
5	Assignment	1-6	-	20
Total				**200**

Note:

1. Pass percentage would be 50% marks in each component, with aggregate pass percentage of 50% and above.
2. Grading will be as under:

Grade	**S**	**A**	**B**	**C**	**D**
Marks Range (in %)	>=85%	>=75% and <85%	>=65% and <75%	>=55% and <65%	>=50% and <55%

3. Theory examination would be conducted online and the paper comprise of MCQ and each question will carry 1 mark.
4. Practical examination/Internal Assessment/Assignment would be evaluated internally.

5. Candidate may apply for re-examination within the validity of registration.
6. The examinations would be conducted in English Language only.

SECTION 2

25. EVIDENCE OF LEVEL

Title: Foundation course in Embedded Application Development			**Level : 4**
NSQF Domain	**Outcomes of the Qualification/Component**	**How the job role relates to the NSQF Level Descriptors**	**NSQF Level**
Process required	The candidate is required to apply the Embedded domain Knowledge for Software and Hardware implementation of Embedded Systems	The job holder is expected to perform his/her work with well-developed skill in implementing Embedded based development for solving particular problems in different sectors Considering that these outcomes are required to be perfected and performed consistently within the defined parameters of the job roles chosen by him/her. It uses procedures in familiar context and has a choice of creativity to enrich the job & take an appropriate decision to handle the situation	4

Professional knowledge	Learn and practice Embedded Development Boards and tools to gain practical and theoretical knowledge. Learning Embedded C to program Embedded Development board. Porting operating Systems on ARM boards and optimizing OS for various applications	The candidate is expected to possess a range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study. The candidate will be able to gain factual and theoretical knowledge in broad contexts within a field of work or study. The participant is expected to have a knowledge of: 1.Working with ARM Development boards and various peripherals 2.Embedded C skills to program development boards, interface various external devices 3.Knowledge of various steps involved in OS porting , process of building a complete and bootable Linux environment	4
Professional skill	Selection of Appropriate Development board and tools available now a days for Embedded Hardware and Software implementation	Candidate will have a wide range of specialized technical skill, clarity of knowledge and practice in broad range	4

		of activity involving standard and non-standard practices.	
Core skill	Candidate will be able for analytical analysis and finding the solution to a real problem using Embedded Solutions He/she can be part of projects and teams. Communicate to the Supervisors/coworkers if anything goes wrong during the process. Aware about the social as well as environmental Situations during working.	The job holder is expected to have behavioral, personal and telephone etiquettes, establish effective rapport with customers, responding appropriately to customers, communicating information to customers (verbal & non-verbal), skill to arithmetic and algebraic principles, basic understanding of social political and natural environment for example, providing interim feedback to customers, in case of delays, processing compliances.	4
Responsibility	Responsible for Implementing Embedded Hardware and Software Development, Firmware Development and Operating System for any target board	The job holder is expected to complete assigned tasks adhering to maintain health & hygiene, maintain safety at workplace & maintain IPR of organization & customers. He/she is expected to undertake on-the-job learning and participate in	4

		training and development, interventions and assessments Hence the individual working in this job role has complete responsibility for delivering quality of his own work & some responsibility for others works too and can be placed at level 5.	

NSQF QUALIFICATION FILE

SECTION 3

EVIDENCE OF NEED

26	**What evidence is there that the qualification is needed?** Attached in Annexure 2
27	**What is the estimated uptake of this qualification and what is the basis of this estimate?** Estimated uptake is 30 students per Batch with 4 Batches per Year and on the basis of Facilities and Infrastructure in respective NIELIT Centre.
28	**What steps were taken to ensure that the qualification(s) does (do) not duplicate already existing or planned qualifications in the NSQF? Give justification for presenting a duplicate qualification** The qualification is originally designed by curriculum head, industrial expert, and academic professional experts. The work group under the guidance of curriculum development committee already conducted desk search as well as refers the qualification packs for as a supporting document for the mapping of curriculum. As per the search it is found that, there are Qualification on NQR portal in Embedded Systems, however essential qualification and purpose of the qualification is different from any other qualification.
29	**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? Specify the review process here** Based on feedback by participants, employers and based on market survey the qualification will be reviewed in every 5 years.

SECTION 4

EVIDENCE OF PROGRESSION

30	**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 has been designed in consultation with industry and domain expert keeping in mind today's need. Qualification file is finalized after discussion and modification through internal committees of NIELIT. Evaluation criteria have been added to ensure progression to related path ways identified as per career path.