QUALIFICATION FILE

Embedded Software Engineer

☒ Short Term Training (STT) ☐ Long Term Training (LTT) ☐ Apprenticeship

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

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

NCrF/NSQF Level: 6

Submitted By:

NATIONAL INSTITUTE OF ELECTRONICS AND INFORMATION TECHNOLOGY

Plot No. 3, PSP Pocket, Sector-8,
Dwarka, New Delhi-110077

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Section 1: Basic Details

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<tr><td>1.</td><td>Qualification Name</td><td colspan="2">Embedded Software Engineer</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 ☐ Has Electives/Options
☐OEM</td><td>NQR Code & version of existing/previous qualification:
2021/ITES/NIELIT/04219, version-2.</td><td>Qualification Name of existing/previous version:
Certified Embedded Software Engineer</td></tr>
<tr><td>4.</td><td>a. OEM Name
b. Qualification Name
(Wherever applicable)</td><td colspan="2">NA</td></tr>
<tr><td>5.</td><td>National Qualification Register (NQR) Code &Version
(Will be issued after NSQC approval)</td><td>QG-06-EH-00567-2023-V2-NIELIT & Version 2</td><td>6. NCrF/NSQF Level: 6</td></tr>
<tr><td>7.</td><td>Award (Certificate/Diploma/Advanced Diploma/ Any Other (Wherever applicable specify multiple entry/exits also & provide details in annexure)</td><td colspan="2">Certificate</td></tr>
<tr><td>8.</td><td>Brief Description of the Qualification</td><td colspan="2">Nature:
❖ The Certificate course is targeted for creating qualified professionals in the field of Embedded & IoT. Qualification has been developed in consultation with industry experts in the domain, aiming at Empowering the future workforce with necessary skills for employment and entrepreneur development of the qualifier.
Purpose:
❖ The purpose is to develop the skill set required for Design and Development of the Embedded System Applications using suitable Hardware and Software tools. This course offers a range of topics of immediate relevance to industry and makes the participants exactly suitable for Embedded Industry</td></tr>
<tr><td>9.</td><td>Eligibility Criteria for Entry for 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>Required Experience (with Specialization - if applicable)</th></tr>
<tr><td>1.</td><td>Final Year B.E./B. Tech in Electronics/ Electronics & Communication/ Electrical/</td><td>NA</td></tr>
</table></td></tr>
</table>

			Electrical and Electronics/Instrumentation/ Electronics & Instrumentation / Instrumentation & Control /Biomedical /Computer Science/Information Technology or above	
		2.	Final Year M.Sc. (Electronics)	NA
		3.	Completed 3 Year B.Sc (Electronics)	1
		4.	Completed 3 Year Diploma (EEE/ECE/CS) after 10th	2

b. Age: 18 years

10.	**Credits Assigned to this Qualification, Subject to Assessment** *(as per National Credit Framework (NCrF))*	32 Credits	**11. Common Cost Norm Category (I/II/III)** *(wherever applicable)***:** Category I (Electronics System Design)
12.	**Any Licensing requirements for Undertaking Training on This Qualification** *(wherever applicable)*	NA	
13.	**Training Duration by Modes of Training Delivery** *(Specify **Total Duration** as per selected training delivery modes and as per the requirement of the qualification)*	**☒Offline ☒Online ☒Blended**	
14.	**Aligned to NCO/ISCO Code/s** *(if no code is available,*	*2512.0501(Embedded Software Engineer)*	

Training Delivery Modes	Theory (Hours)	Practical (Hours)	OJT Mandatory (Hours)	ES (Hours)	Total (Hours)
Classroom (offline)	260	340	240	120	960
Online	260	340	240*	120	
Blended	Online: 210 Offline: 50	Online: 270 Offline: 70	240*	Online: 120	

**based on the project OJT can be done online/ offline/mixed mode.*

The mode of delivery shall be based on the regional demand and can be offered in any of the above modes mentioned.

	mention the same)		
15.	**Progression path after attaining the qualification** *(Please show Professional and Academic progression)*	*Academic:* *Advanced courses in Embedded Real-time systems area like the building of YOCTO Linux for Embedded Systems.* *Professional:* *Embedded Software Engineer –> Team Lead (Embedded Software) –> Project Manager (Embedded Software & Real-Time Systems)*	
16.	**Other Indian languages in which the Qualification & Model Curriculum are being submitted**	Only English	
17.	**Is similar Qualification(s) available on NQR-if yes, justification for this qualification**	**☐ Yes ☒ No URLs of similar Qualifications:**	
18.	**Is the Job Role Amenable to Persons with Disability**	**☒ Yes ☐ No** **If "Yes", specify applicable type of Disability:** a. Locomotor Disability ● Leprosy Cured Person ● Dwarfism ● Muscular Dystrophy ● iv. Acid Attack Victims b. Visual Impairment ● Low Vision	
19.	**How Participation of Women will be Encouraged**	Through funding from the Government under various schemes and projects.	
20.	**Are Greening/ Environment Sustainability Aspects Covered** *(Specify the NOS/Module which covers it)*	**☐ Yes ☒ No**	
21.	**Is Qualification Suitable to be Offered in Schools/Colleges**	**Schools ☐ Yes ☒ No Colleges ☒ Yes ☐ No**	
22.	**Name and Contact Details of Submitting / Awarding Body SPOC** *(In case of CS or MS, provide details of both Lead AB & Supporting ABs)*	**Name:** Shoukath Cherukat **Email:** shoukath@nielit.gov.in **Contact No.:** 044-24421445 **Website:** https://nielit.gov.in/	
23.	**Final Approval Date by NSQC:** 23.06.2023	**24. Validity Duration:** 3 Years	**25. Next Review Date:** 23.06.2026

Section 2: Module Summary

Mandatory NOS/s of Qualifications

I. *Embedded System Design with Embedded C Programming on ARM Cortex Microcontrollers*
II. *Implementation of Complex Embedded Systems using suitable Operating Systems*
III. *Real-Time Embedded System Design with RTOS*
IV. *IoT Application Development with Python and Data Analytics*
V. *Complex Embedded Application Development with the understanding of Embedded Protocols and Device Driver Concepts*

duration and assessment criteria at NOS/ Module level. For further details refer to the curriculum document.

***Th**.-Theory **Pr.**-Practical **OJT**-On the Job **Man.**-Mandatory Training **Rec.**-Recommended **Proj.**-Project*

S. No	NOS/Module Name	NOS/Module Code & Version (if applicable)	Core/ Non-Core	NCrF/ NSQF Level	Credits as per NCrF	Training Duration (Hours)					Assessment Marks					
						Th.	Pr.	OJT - Man.	OJT- Rec.	Total	Th.	Pr.	Proj.	Viva	Total	Weightage (%) *(if applicable)*
1.	NOS1: Embedded System Design with Embedded C Programming on ARM Cortex Microcontrollers	NIE/ELE/ N0201, version2	Core	6	5	70	80	0	0	150	70	60	0	20	150	22
2.	NOS2:Implementation of Complex Embedded Systems using suitable Operating Systems	NIE/ELE/ N0202, version2	Core	6	2	30	30	0	0	60	30	15	0	5	50	7
3.	NOS3: Real-Time Embedded System Design with RTOS	NIE/ELE/ N0203, version2	Core	6	2	30	30	0	0	60	33	15	0	10	58	8

S. No	NOS/Module Name	NOS/Module Code & Version (if applicable)	Core/ Non-Core	NCrF/ NSQF Level	Credits as per NCrF	Training Duration (Hours)					Assessment Marks					
						Th.	Pr.	OJT - Man.	OJT-Rec.	Total	Th.	Pr.	Proj.	Viva	Total	Weightage (%) *(if applicable)*
4.	NOS4: IoT Application Development with Python and Data Analytics	NIE/ELE/N0204, version2	Core	6	7	70	140	0	0	210	100	57	0	20	177	25
5.	NOS5: Complex Embedded Application Development with an understanding of Embedded Protocols and Device Driver Concepts"	NIE/ELE/N0205, version2	Core	6	4	60	60	0	0	120	67	33	0	5	105	15
Subtotal						**260**	**340**	**0**	**0**		**300**	**180**	**0**	**60**	**540**	**77**
6.	NOS6: Employability Skills	DGT/VSQ/N010, version1 h	Non-Core	6	4	120	0	0	0	120	0	0	0	60	60	9
7.	NOS7: Implementation of embedded project on real time problem/ OJT		Core	6	8	0	0	240	0	240	0	0	100	0	100	14
Duration (in Hours) / Total Marks					**32**	**960**					**700**					**100**

Assessment Components	NOS Included	Duration (in mins)	Marks
Theory Paper 1 – Embedded Linux & C Programming	1,2	90	100
Theory Paper 2 – Embedded RTOS and Device Driver Development	3,5	90	100
Theory Paper 3 – IoT Data Analytics	4	90	100
Practical Paper 1- Embedded Programming for ARM, Linux & RTOS	1,2,3	90	90
Practical Paper 2 - Device Driver and IoT	4,5	90	90
Internal Assessment	6		60
OJT/Assignment	1,2,3,4,5,6		60
Major Project	1,2,3,4,5,6		100
Total			**700**

Section 3: Training Related

1.	**Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	B.E./B. Tech in Electronics/ Electronics & Communication/ Electrical/ Electrical and Electronics/Instrumentation/ Electronics & Instrumentation / Instrumentation & Control /Biomedical /Computer Science/Information Technology Minimum 1 year of experience in the field of Embedded systems
2.	**Master Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	B.E./B. Tech in Electronics/ Electronics & Communication/ Electrical/ Electrical and Electronics/Instrumentation/ Electronics & Instrumentation / Instrumentation & Control /Biomedical /Computer Science/Information Technology Minimum 5 years of experience in the field of Embedded systems
3.	**Tools and Equipment Required for Training**	☒Yes ☐No (*If "Yes", details to be provided in Annexure)* *Details available in Annexure II*

4.	**In Case of Revised Qualification, Details of Any Upskilling Required for Trainer**	Nil

Section 4: 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)*	
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
4.	**Assessment Mode** *(Specify the assessment mode)*	Online for Theory Online/ Offline/ Blended for other assessment components depending on the region where the assessment is conducted
5.	**Tools and Equipment Required for Assessment**	☒ Same as for training ☒ Yes ☐ No (D*etails to be provided in Annexure-II)*

Section 5: Evidence of the need for the Qualification

Provide Annexure/Supporting documents name.

1.	**Latest Skill Gap Study (not older than 2 years) (Yes/No):** Yes, Available in Annexure-A: Evidence of Need
2.	**Latest Market Research Reports or any other source (not older than 2 years) (Yes/No):** Yes, Available at Annexure-A: Evidence of Need
3.	**Government /Industry initiatives/ requirement (Yes/No):** Yes, Available at Annexure-A: Evidence of Need
4.	**Number of Industry validation provided:** 5
5.	**Estimated no. of persons to be trained and employed:** 500 persons per year shall be trained.
6.	**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 6: Annexure & Supporting Documents Checklist

1.	**Annexure:** NCrF/NSQF level justification based on NCrF level/NSQF descriptors *(Mandatory)*	Available at Annexure-I: Evidence of Level
2.	**Annexure:** List of tools and equipment relevant for qualification *(Mandatory, except in case of online course)*	*Available at Annexure-II: Tools and Equipment*
3.	**Annexure:** Detailed Assessment Criteria *(Mandatory)*	*Available at Annexure-VI: Detailed Assessment Criteria*
4.	**Annexure:** Assessment Strategy *(Mandatory)*	*Available at Annexure-VII: Detailed Assessment Strategy*
5.	**Annexure:** Blended Learning *(Mandatory, in case selected Mode of delivery is "Blended Learning")*	*Available at Annexure-V: Blended Learning*
6.	**Annexure:** Industry Validation Summary	*Available at Annexure-III: Industry Validation* *The copy is available at Annexure-B*
7.	**Annexure:** Multiple Entry-Exit Details *(Mandatory, in case qualification has multiple Entry-Exit)*	*NA*
8.	**Annexure:** Acronym and Glossary *(Optional)*	*Available at Annexure-VIII: Acronym and Glossary*
9.	**Supporting Document:** Model Curriculum *(Mandatory – Public view)*	*Available at Annexure-C Model Curriculum* *Syllabus is available at Annexure-D*
10.	**Any other document you wish to submit:**	*NA*

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	Theoretical and practical knowledge in implementation of real time embedded systems	Requires a command of wide-ranging specialised theoretical and practical skills, involving variable routine and non-routine contexts.	6
Professional and Technical Skills/ Expertise/ Professional Knowledge	Theoretical knowledge in developing embedded real time applications using microcontroller boards based on ARM cortex soft core architecture and Embedded/Real Time Operating Systems.	Wide-ranging factual and theoretical knowledge in broad contexts within a field of work or study.	6
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	Ability to develop hardware and software systems as per the requirement of the application for solving real life problems. v	Wide range of cognitive and practical skills required to generate solutions to specific problems in a field of work of study.	6
Broad Learning Outcomes/Core Skill	Ability to independently develop the logic required for implementing real time embedded systems.	Good logical and mathematical skill understanding of social political and natural environment and organising information, communication and presentation skill.	**6**
Responsibility	Ability to understand the social political and natural environment and to organize the information	Full responsibility for output of group and development	**6**

Annexure II: Tools and Equipment (Lab Set-Up)

LIST OF EQUIPMENT (For a batch of 20 students)

Description		Qty	Specifications
1	Classroom	1	30 Sq.m
2	Student Chair	20	
3	Student Table	20	
4	LCD Projector	1	
5	Trainer Chair & Table	1	
6	Pin up Boards	1	
7	White Board	1	
	Computer Lab		
1	Desktop computer with accessories	20	Installed with any • FreeRTOS • OpenSTM, CubeMX • Segger Timing Analysis Tool • Code Composer Studio(CCS) • Proteus VSM • Arduino IDE • Keil Software
2	Desk jet printer	1	A4

Annexure III: Industry Validations Summary

S. No	Organization Name[&]	Representative Name	Designation	Contact Address	Contact Phone No	E-mail ID
1	Gannet Engineering Pvt Ltd.	Madhusudhan Chellappa	Managing Director	55/10 Soundarya Colony, Annanagar West, Chennai, TN 600101 Cowork Café, No.28, K No.2453, Kasavanahalli, Bengaluru, KA 560035	+91 8197817272,	madhu.chellappa@gannetsolutions.com
2	Mahindra & Mahindra	Gajendra Singh	Assistant Manager-RPA/Digitization Manufacturing 4.0	Kandivali East, Mumbai - 400101	9990893514	singh.gajendra@mahindra.com
3	LDRA Technology Pvt. Ltd.	Shinto Joseph	Director-South East Asia Operations	B3, 3rd floor ,Tower B, Golden Enclave, Old Airport Road, Bengaluru, Karnataka 560017		shinto.joseph@ldra.com
4	NIT Skills India Pvt. Ltd.	Dr. Adapelly Vidyasagar	Managing Director	Techno Residency, Fifth floor, Hitech City, Opp. Raheja Mind space, Madhapur, Hyderabad-500081, Telangana, Indin	9396610615	Sagar.a@nitindia.in
5	Elysium Technologies Pvt Ltd, Madurai	K. Arun Kumar	Skill Head	Ground Floor, A Block, 'Elysium Campus, 229, Church Rd, Madurai, Tamil Nadu 625020	8220056477	k.arunkumar@elysiumgroup.com

[&]The Documents are available at Annexure-B

Annexure IV: Training & Employment Details

Training and Employment Projections:

Year	Total Candidates		Women		People with Disability	
	Estimated Training #	Estimated Employment Opportunities	Estimated Training #	Estimated Employment Opportunities	Estimated Training #	Estimated Employment Opportunities
2023	75	25	15	5	2	1
2024	150	50	30	15	5	2
2025	150	50	30	15	5	2
2026	75	25	15	5	2	1

Data to be provided year-wise for next 3 years

Training, Assessment, Certification, and Placement Data for previous versions of qualifications:

Qualification Version	Year	Total Candidates				Women				People with Disability			
		Trained	Assessed	Certified	Placed	Trained	Assessed	Certified	Placed	Trained	Assessed	Certified	Placed
	2021	22	15	15	15	6	6	6	6				
	2022	100	68*	10	11	20	5	4	5				

** Result is pending for 58 students & 24 Candidates are yet to write the exam*

Applicable for revised qualifications only, data to be provided year-wise for past 3 years.

List Schemes in which the previous version of Qualification was implemented:

1. Project titled "Self-employment Capacity building of the Engineering pass-out students belonging to Scheduled Caste/Scheduled Tribe community" Funded by MeitY, GoI.

Content availability for previous versions of qualifications:

☐ Participant Handbook ☐ Facilitator Guide ☐ Digital Content ☐ Qualification Handbook

Languages in which Content is available: English

Annexure V: Blended Learning

Blended Learning Estimated Ratio & Recommended Tools:

S. No.	Select the Components of the Qualification	List Recommended Tools – for all Selected Components	Offline : Online Ratio
1	☐Theory/ Lectures - Imparting theoretical and conceptual knowledge	Online interaction platforms like JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	20:80
2	☐Imparting Soft Skills, Life Skills, and Employability Skills /Mentorship to Learners	Online interaction platforms like JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	20:80
3	☐Showing Practical Demonstrations to the learners	Through Virtual Simulation Software (Proteous- VSM) and Online interaction platforms like JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	20:80
4	☐Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	Through Virtual Simulation Software (Proteous- VSM) and Online interaction platforms like JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	20:80
5	☐Tutorials/ Assignments/ Drill/ Practice	Online interaction platforms like JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	20:80
6	☐Proctored Monitoring/ Assessment/ Evaluation/ Examinations	NIELIT Remote Proctored Software	Online: 100% Theory Offline: 100% Practical
7	☐On the Job Training (OJT)/ Project Work Internship/ Apprenticeship Training	Simulated Platform	Either 100% online in a virtual environment Or 100% offline in the Industry.

Annexure VI: Detailed Assessment Criteria

Detailed assessment criteria for each NOS/Module are as follows:

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Assignment/ Internal Marks
NOS1: Embedded System Design with Embedded C Programming on ARM Cortex Microcontrollers	**'C' and Embedded C** PC1- Understand the fundamentals of C programming PC2- Programming with embedded C in contrast with C language PC3- Develop applications using Embedded C Programming	17	15	06	5
	Embedded Concepts PC4- Understand the various hardware and software architecture of embedded systems PC5- Hands-on exercises on development and debugging tools	17	15	06	5
	Introduction to ARM Cortex Architecture PC6- Understand The ARM Architecture, Overview of Cortex Architecture, Register Set and Modes PC7- Hands-on exposure to ARM Cortex M4 Development Environment, Assembler and Compiler, Linkers and Debuggers, ARM, Thumb & Thumb2 instructions.	18	15	06	5
	Cortex M4 Microcontrollers & Peripherals PC8-Understand the Cortex M4-based controller architecture, Memory mapping and Cortex M4 Peripherals. PC9- Understand the Cortex M4 interrupt handling –NVIC PC10-Application development with Cortex M4 controllers using standard peripheral libraries.	18	15	07	5
	Total Marks	**70**	**60**	**0**	**20**
NOS2: Implementation of Complex Embedded Systems using suitable Operating Systems	**Basic Operating System Concepts** PC1- Understand the Fundamentals of Embedded Linux OS , Applications and Products. PC2-Configure Linux environment for ARM based Target Boards.	8	4	0	1
	Tool-chain: Configuration and Cross-Compilation PC3- Understand the Embedded Environment Tools, GNU Tool-chain Cross Compilers. PC4- Configure Tool-Chain for ARM Platforms.	8	4	0	1
	Embedded Linux Kernel PC5- Embedded Environment Tools, GNU Tool-chain Cross	8	4	0	1

	Compilers. PC6- Demonstrate Linux Booting Process and to configure Linux Kernels on ARM based Embedded Boards.				
	Embedded Linux Application Programming PC7- Understanding the Kernel Compilation, Booting the kernel using u-boot, Porting Linux in ARM Boar PC8- Develop ARM based Embedded Applications with Linux OS.	6	3	0	2
	Total Marks	**30**	**15**	**0**	**5**
NOS3: Real-Time Embedded System Design with RTOS	**Understanding of RTOS concepts** PC1- Understanding of RTOS concepts PC2- List Step by step method to run RTOS on STM32 MCUs	11	5	0	3
	RTOS internals PC3- Use cases for tasks, semaphores, queues, event flags and timers PC4- Demonstrate RTOS Scheduler with memory Management.	11	5	0	3
	Embedded system using RTOS PC5- Design concepts needed to build an embedded system using RTOS PC6- Understand complete ARM Cortex M and FreeRTOS Priority model and its configuration related information's.	11	5	0	4
	Total Marks	**33**	**15**	**0**	**10**
NOS4: IoT Application Development with Python and Data Analytics	**Python Programming** PC1-Understand the concept of object oriented programming and its applications PC-2 Develop problem solving capability using python scripts	25	17	0	5
	IoT Concepts PC3- Understand the evolution of IoT, reference architecture, building block and challenges PC-4 Implement an IoT application using Development Boards	25	17	0	5
	Data Science and Analytics PC-5 Choose right Data Analytic/ Machine learning tool for various IoT application PC-6 Able to use Data Visualization tools for interactive	25	12	0	5

	dynamic visualizations				
	Statistical and Machine Learning PC-7 Able to Understand the mathematical principles required for Data Analytics and Machine Learning. PC-8 Able to implement Various ML algorithms using Python.	25	11	0	5
	Total Marks	**100**	**57**	**0**	**20**
NOS5: Complex Embedded Application Development with the understanding of Embedded Protocols	**Embedded Protocols** PC-1 Demonstrate Different embedded protocols like SPI, I2C, USB and CAN. PC-2 Able to choose right protocol for the different embedded applications.	22	11	0	2
	Linux Device drivers PC-3 Build driver program for various devices in Linux kernel. PC-4 Hands-on expertise in File Operations in Char Device	22	11	0	2
	Kernel driver for external peripherals PC-5 Able to develop Kernal driver for Keyboard, Speaker, and RTC PC-6 Understand the Communication between Hardware Memory Space and IO	23	11		1
	Total Marks	**67**	**33**	**0**	**5**
NOS6: Employability Skills	Employability Skills	0	0	0	60
	Total Marks	**0**	**0**	**0**	**60**
NOS7: Project / OJT	Project	**0**	**0**	**100**	0
Grand Total-700		**300**	**180**	**100**	**120**

Annexure VII: Assessment Strategy

- 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), Practical assessment, Internal assessment, Project/Presentation/ Assignment, Major Project. The emphasis is on the
- practical demonstration of skills & knowledge gained by the candidate through the training. Each OUTCOME is assessed & marked separately. A candidate is
- required to pass all OUTCOMES individually based on the passing criteria.
- About Examination Pattern:
- 1. The question papers for the theory and practical 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 through remote proctoring methodology. Theory examination would be conducted online and the paper comprise of MCQ. Conduct of assessment are through trained proctors. Once the test begins, remote proctors have full access to 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.
- 4. An External Examiner/ Observer may be deployed including NIELIT officials for evaluation of Practical examination/ internal assessment / Project/ Presentation/. Major Project (if applicable) would be evaluated preferably by external/ subject expert including NIELIT officials.
- 5. Pass percentage would be 50% marks in each component.
- 6. Candidates may apply for re-examination within the validity of registration (only in the assessment component in which the candidate failed).

- 7. For re-examination prescribed examination fee is required to be paid by the candidate only for the assessment component in which the candidate wants to reappear.
- 8. There would be no exemption for any paper/module for candidates having similar qualifications or skills.
- 9. 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: Acronym and Glossary

Acronym

Acronym	Description
AA	Assessment Agency
AB	Awarding Body
ISCO	International Standard Classification of Occupations
NCO	National Classification of Occupations
NCrF	National Credit Framework
NOS	National Occupational Standard(s)
NQR	National Qualification Register
NSQF	National Skills Qualifications Framework
OJT	On the Job Training

Glossary

Term	Description
National Occupational Standards (NOS)	NOS defines 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.
Long Term Training	Long-term skilling means any vocational training program undertaken for a year and above. https://ncvet.gov.in/sites/default/files/NCVET.pdf