QUALIFICATION FILE–Standalone NOS

Fundamentals of sensing and actuation in embedded systems

☐ 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)

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Section 1: Basic Details

<table>
<tr><td>1.</td><td>NOS-Qualification Name</td><td colspan="2">Fundamentals of sensing and actuation in embedded systems</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 the existing /previous qualification: NA</td><td>Qualification Name of the existing/previous version: NA</td></tr>
<tr><td>4.</td><td>National Qualification Register (NQR) Code & Version</td><td>NG-04-EH-02888-2024-V1-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">The course has been developed to focus on understanding and working with transducers, sensors, and actuators in various applications. It covers theoretical aspects such as basic principles of transduction, sensor classification, and actuator characteristics, as well as practical aspects like common sensor and actuator types, their applications in different industries, and integration with microcontrollers and embedded systems.</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 or equivalent in Science with Physics and Maths</td><td>NA</td></tr>
<tr><td>2</td><td>2 Years of 3-Years Diploma in Electronics and Communication Engineering/ Electrical Engineering/CS/IT and allied branches after class 10th</td><td>NA</td></tr>
<tr><td>3</td><td>NSQF Level 3.5 in Electronics and Communication Engineering/ Electrical Engineering/CS/IT and allied branches</td><td>1.5 Years</td></tr>
<tr><td>4</td><td>NSQF Level 3 in Electronics and Communication Engineering/ Electrical Engineering/CS/IT and allied branches</td><td>1.5 Years</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 Credit</td><td>9. Common Cost Norm Category (I/II/III) (wherever applicable):
Category I (Electronics System Design)</td></tr>
</table>

<table>
<tr><td>10.</td><td>Any Licensing Requirements for Undertaking Training on This Qualification (wherever applicable)</td><td>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>☒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>30</td><td>30</td><td>60</td></tr>
</table>
Training shall be conducted in any of the 3 modes depending on the regional need.

(Refer Blended Learning Annexure-V for details)</td></tr>
<tr><td>12.</td><td>Assessment Criteria</td><td>
<table>
<tr><th>Theory (Marks)</th><th>Practical (Marks)</th><th>Project/ Presentation /Assignment (Marks)</th><th>Viva/ Internal Assessment (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 centralized 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>Embedded System Developer (A-Level 'Embedded System Design')</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 file 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)*	**Name:** Rajesh M **Email:** rajesh.m@nielit.gov.in **Website:** https://nielit.gov.in/ **Name:** Prashant Pal **Email:** prashantpal@nielit.gov.in **Website:** https://nielit.gov.in/ **Name:** Anirban Jyoti Hati **Email:** anirban@nielit.gov.in **Website:** https://nielit.gov.in/ **Name:** Ankit Kumar **Email:** ankit@nielit.gov.in **Website:** https://nielit.gov.in/	
19.	**Final Approval Date by NSQC: 25.07.2024**	**20. Validity Duration: 3 years**	**21. Next Review Date: 25.07.2027**

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 Electronics/ Electronics & Communication/ Electrical/ Electrical and Electronics/Instrumentation/ Electronics & Instrumentation / Instrumentation & Control /Computer Science/Information Technology Minimum 2 year of experience in the field of Embedded Systems Development
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 /Computer Science/Information Technology Minimum 3 year of experience in the field of Embedded Real Time systems
3.	**Tools and Equipment Required for the Training**	☒ Yes ☐No Available at Annexure-II
4.	**In Case of Revised NOS, details of Any Upskilling Required for Trainer**	Not Applicable

Section 3: Assessment Related

1.	**Assessor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	B.Tech or Equivalent as per NCrF + 3 years relevant experience
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 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.
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)*	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, Available at Annexure-A: Evidence of Need
2.	Number of Industry validations provided: 10
3.	Estimated number of people to be trained: 500 persons per year shall be trained.
4.	Evidence of Concurrence/Consultation with Line/State Departments (In case of regulated sectors): 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.
5.	Latest Skill Gap Study (not older than 2 years) (Yes/No): Yes, Available in Annexure-A: Evidence of Need

6.	Latest Market Research Reports or any other source (not older than 2 years) (Yes/No): Yes, Available at Annexure-A: Evidence of Need

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: Standalone NOS- Performance Criteria details
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	• Ability to comprehend the fundamental principles of transduction and classification of sensors based on sensing mechanisms and measured quantities. • Competence in understanding actuator fundamentals, including classification based on output types and characteristics like response time, force, torque, and displacement. • Proficient in integrating sensors and actuators with microcontrollers and embedded systems, including signal conditioning, amplification techniques, and calibration methods.	1. By emphasizing a strong understanding of fundamental principles in transduction, sensor classification, and actuator fundamentals. 2. This knowledge forms the theoretical foundation for effectively integrating sensors and actuators into systems, including signal conditioning, amplification techniques, and calibration methods.	4
Professional and Technical Skills/ Expertise/ Professional Knowledge	• Mastery of C programming language specifically tailored for embedded systems, including knowledge of storage classes, data types, program flow control, memory management, pointers, arrays, and structures, unions, and data structures. • Comprehensive understanding of embedded systems principles, architectures, hardware-software interactions, application areas, and recent trends in the field, coupled with expertise in development and debugging tools for embedded systems. • In-depth knowledge of ARM Cortex architectures, including Cortex M4 and Cortex-A, covering topics such as register set, instruction set architecture, memory hierarchy, interrupt handling mechanisms, and development environment tools like assemblers, compilers, linkers, and debuggers.	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	• Understand the principles of transduction, sensor classification, and actuator operation to design and integrate sensor-actuator systems for diverse applications.	1. Can explain Entrepreneurial Mindset and describe the importance of it in the context of opportunity curation for future jobs.	4

	• Analyze sensor and actuator requirements, troubleshoot integration issues, and optimize system performance through calibration and compensation methods. • Apply sensor and actuator knowledge creatively in entrepreneurial ventures, adapting to evolving industry trends and technological advancements in measurement and control systems.	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	
Broad Learning Outcomes/ Core Skill	• Demonstrate proficiency in understanding transducers, sensors, and actuators, including their classification, principles of operation, characteristics, and common types. • Integrate sensors and actuators effectively with microcontrollers and embedded systems, considering signal conditioning, amplification, calibration, and compensation techniques. Ensure seamless interaction between sensors, actuators, and control systems for accurate and reliable performance. • Identify and troubleshoot issues related to sensor and actuator integration, such as signal noise, calibration errors, or compatibility issues. Develop practical solutions and implement adjustments to optimize system functionality and performance.	1. Proficiency in understanding transducers, sensors, and actuators, including their classification, principles of operation, characteristics, and common types, is a core skill. 2. Ability to integrate sensors and actuators effectively with microcontrollers and embedded systems, considering signal conditioning, amplification, calibration, and compensation techniques, is a core skill.	4
Responsibility	• Ability to integrate various sensors and actuators into measurement and control systems with precision and reliability. • Proficiency in calibrating sensors and actuators to ensure accurate and consistent data acquisition and actuation.	1. Takes complete responsibility for delivery and quality of own work and output as also the subordinates. 2. Shares responsibility for the group tasks.	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 (750 Sq. 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	Internet Connectivity	Seamless internet connectivity with at least 100 Mbps without firewall	
6	Development Board	ARM Cortex-M4 microcontroller development board, Various types of sensors (temperature, pressure, proximity, motion), actuators (electric motors, solenoids, cylinders), signal conditioning circuits, calibration tools, and interfacing components	15

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, Hydrabad-500020	7879982075	teena.panthi@aisect.org
2	NICE SHIKSHA VIKAS KENDRA	Motilal Ohdar	Secretory	Moti House, (Nice Computer Gali), Prince Chowk, Simdega, Jharkhand	7992489955	vtpnice12@gmail.com
3	Aajivika Global Skill Private Limited	Mukesh Kumar Verma	Director	Beside Vishal Trade, dasmile chowk, Khunti Road Ranchi, Jharkhand-835221	9507952882	aajivikaglobal@gmail.com
4	B. G. Infotech	Amal Das	Centre Head	Kakdihi, Mecheda, Purba, Medinipur	9434996748	bginfotech2007@gmail.com
5	Devendra Nath Institute of Information Mation Technology	Amit Kumar Tripathy	Director	Uska Road, Near Naveen Sabji Mandi, Tetari Bazar, Siddharth Nagar-272207	8765562815	aktjob@gmail.com
6	Inditech Software Wizard Pvt. Ltd.	Sandip Ghosh	Course Coordinator	Mohiari Chanpiritala, Po: Andul Mouri, PS: Domjur, Distt: Howrah, West Bengal-711302	9230027415	swizardrecruitment@gmail.com
7	Prasanthi Polytechnic	D. Prasad	Principal	Duppituru (Vill), Atchutapuram (Md). Visakhapatnam (Dist), Andhara Pradesh-531011	9849952573	prasadreddy.1279@gmail.com
8	JAN SAMRIDHI DUMKA	Gobind Nath Maji	Director	Near Gyan School, Dudhani, Dumka, Jharkhand-814101	8789620133	Gobind107@gmail.com

9	Sidhi Vinayak Academy	Neha Verma	Director	Shiv Narayan Kunj, B Block, Shivaji Nagar, Hethu, Ranchi, JH-834002	8789837772	sidhiacadmey@gmail.com
10	Surekha IT Services	Anjani K	Manager	8-3-191/84/302, Sharan Residency, Vengalrao Nagar, Hyderabad-500038, Telangana	8125134134	info@surekhaitservices.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:

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.	70:30
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.	70:30
3	Showing Practical Demonstrations to the learners	Through Virtual Simulation Software (Proteus- VSM) and Online interaction platforms like JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	70:30

4	Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	Through Virtual Simulation Software (Proteus- VSM) and Online interaction platforms like JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	70:30
5	Tutorials/ Assignments/ Drill/ Practice	Online interaction platforms like JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	70:30
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: Standalone NOS- Performance Criteria details

1. Description

The objective is to understand transducers' role, sensor classifications, principles of transduction, and sensor characteristics.

2. Scope

The scope covers the following:

This course offers an in-depth introduction to transducers, sensors, and actuators, focusing on their roles in measurement and control systems. Students will learn about the principles of transduction, sensor and actuator classifications, characteristics, and applications in various fields. The course also covers interfacing these components with microcontrollers, signal conditioning, and calibration techniques. By the end, students will be equipped to implement sensors and actuators in real-world applications, enhancing their skills in modern measurement and control technologies.

3. Elements and Performance Criteria

Sensor Fundamentals and Types:

- Ability to explain the basic principles of sensors and their functions accurately.
- Demonstrate proficiency in classifying sensors based on measured quantities and sensing mechanisms.
- Evaluate sensor characteristics such as sensitivity, accuracy, linearity, and range in practical scenarios.

Actuator Fundamentals and Applications:

- Demonstrate understanding of actuator functions and classify them based on output types and characteristics.
- Apply knowledge of actuators to solve real-world problems in robotics, automation, and fluid control.
- Evaluate and select appropriate actuators for specific applications based on performance criteria like response time, force, torque, and displacement.

Integration and Interfacing Techniques:

- Successfully interface sensors and actuators with microcontrollers and embedded systems.
- Apply signal conditioning and amplification techniques effectively to improve sensor and actuator performance.
- Demonstrate calibration and compensation methods to ensure accurate integration and reliable functioning in control systems.

4. **Knowledge and Understanding (KU):**

The individual on the job needs to know and understand:

Knowledge of Transducers and Sensors

- Understand the role of transducers in measurement and control systems.

Understanding Actuators and their Applications

- Comprehend the functions and classifications of actuators according to their output types and characteristics.

Integration Techniques and Practical Considerations

- Understand the integration of sensors and actuators with microcontrollers and embedded systems.

5. Generic Skills (GS):

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

Problem-solving: Analyze sensor and actuator requirements in different applications to propose suitable solutions.

Hands-on Experience Conduct experiments to validate sensor accuracy, linearity, and range under different conditions.

Technical Communication: Effectively communicate technical concepts related to transducers, sensors, and actuators.

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 /Presentation /Assignment Marks	Viva/ Internal Assessment (Marks)
NOS1: Fundamentals of sensing and actuation in embedded systems. NCO Code: NIE/ELE/N0223	*Sensor Fundamentals and Types*	**30**	**20**	-	**6**
	• Ability to explain the basic principles of sensors and their functions accurately.	-	-	-	-
	• Demonstrate proficiency in classifying sensors based on measured quantities and sensing mechanisms.	-	-	-	-
	• Evaluate sensor characteristics such as sensitivity, accuracy, linearity, and range in practical scenarios.	-	-	-	-
	Actuator Fundamentals and Applications:	**30**	**20**	-	**7**
	• Demonstrate understanding of actuator functions and classify them based on output types and characteristics.	-	-	-	-
	• Apply knowledge of actuators to solve real-world problems in robotics, automation, and fluid control.	-	-	-	-
	• Evaluate and select appropriate actuators for specific applications based on performance criteria like response time, force, torque, and displacement.	-	-	-	-
	Integration and Interfacing Techniques:	**40**	**20**	-	**7**
	• Successfully interface sensors and actuators with	-	-	-	-

	microcontrollers and embedded systems.				
	• Apply signal conditioning and amplification techniques effectively to improve sensor and actuator performance.	-	-	-	-
	• Demonstrate calibration and compensation methods to ensure accurate integration and reliable functioning in control systems.	-	-	-	-
		100	**60**	**20**	**20**
NOS Total		**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 (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.