



## QUALIFICATION FILE–Standalone NOS

### Essentials of Embedded System for Medical Electronics

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: 5

Submitted By:

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**Section 1: Basic Details**

1.	<b>NOS-Qualification Name</b>	<b>Essentials of Embedded System for Medical Electronics</b>																
2.	<b>Sector/s</b>	Electronics																
3.	<b>Type of Qualification</b> <input checked="" type="checkbox"/> New <input type="checkbox"/> Revised	<b>NQR Code &amp; version of the existing /previous qualification:</b> NA	<b>Qualification Name of the existing/previous version:</b> NA															
4.	<b>National Qualification Register (NQR) Code &amp; Version</b>	NG-05-EH-02899-2024-V1-NIELIT	<b>5. NCrF/NSQF Level:</b> 5															
6.	<b>Brief Description of the Standalone NOS</b>	This NOS provides a comprehensive overview of the critical role of electronic technology in healthcare. Students will delve into the unique challenges and regulatory landscape of medical electronics, exploring the intricacies of medical device development boards, sensor applications, signal processing techniques, and wireless communication systems.																
7.	<b>Eligibility Criteria for Entry for a Student/Trainee/Learner/Employee</b>	<p><b>a. Entry Qualification &amp; Relevant Experience:</b></p> <table border="1"> <thead> <tr> <th>S. No.</th> <th><b>Academic/Skill Qualification (with Specialization - if applicable)</b></th> <th><b>Relevant Experience (with Specialization - if applicable)</b></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2nd year of UG in Electronics and Communication Engineering/ Electrical Engineering/CS/IT/Physics/Electronics and allied branches</td> <td>NA</td> </tr> <tr> <td>2</td> <td>3 Years of Diploma in Electronics and Communication Engineering/ Electrical Engineering/CS/IT/Physics/Electronics and allied branches after class 10th</td> <td>1.5 Years</td> </tr> <tr> <td>3</td> <td>2 Year of diploma in Electronics and Communication Engineering/ Electrical Engineering/CS/IT/Physics/Electronics and allied branches after class 12<sup>th</sup></td> <td>NA</td> </tr> <tr> <td>4</td> <td>NSQF Level 4.5 in Electronics and Communication Engineering/ Electrical Engineering/CS/IT/Physics/Electronics and allied branches</td> <td>1.5 Years</td> </tr> </tbody> </table>		S. No.	<b>Academic/Skill Qualification (with Specialization - if applicable)</b>	<b>Relevant Experience (with Specialization - if applicable)</b>	1	2nd year of UG in Electronics and Communication Engineering/ Electrical Engineering/CS/IT/Physics/Electronics and allied branches	NA	2	3 Years of Diploma in Electronics and Communication Engineering/ Electrical Engineering/CS/IT/Physics/Electronics and allied branches after class 10th	1.5 Years	3	2 Year of diploma in Electronics and Communication Engineering/ Electrical Engineering/CS/IT/Physics/Electronics and allied branches after class 12 <sup>th</sup>	NA	4	NSQF Level 4.5 in Electronics and Communication Engineering/ Electrical Engineering/CS/IT/Physics/Electronics and allied branches	1.5 Years
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1	2nd year of UG in Electronics and Communication Engineering/ Electrical Engineering/CS/IT/Physics/Electronics and allied branches	NA																
2	3 Years of Diploma in Electronics and Communication Engineering/ Electrical Engineering/CS/IT/Physics/Electronics and allied branches after class 10th	1.5 Years																
3	2 Year of diploma in Electronics and Communication Engineering/ Electrical Engineering/CS/IT/Physics/Electronics and allied branches after class 12 <sup>th</sup>	NA																
4	NSQF Level 4.5 in Electronics and Communication Engineering/ Electrical Engineering/CS/IT/Physics/Electronics and allied branches	1.5 Years																

		5	NSQF Level 4 Electronics and Communication Engineering/ Electrical Engineering/CS/IT/Physics/Electronics and allied branches	1.5 Years								
<b>b. Age:18 years</b>												
8.	<b>Credits Assigned to this NOS-Qualification, Subject to Assessment (as per National Credit Framework (NCrF))</b>	2 Credits		9. <b>Common Cost Norm Category (I/II/III) (wherever applicable):</b> Category I (Electronics System Design)								
10.	<b>Any Licensing Requirements for Undertaking Training on This Qualification (wherever applicable)</b>	NA										
11.	<b>Training Duration by Modes of Training Delivery (Specify Total Duration as per selected training delivery modes and as per requirement of the qualification)</b>	<input checked="" type="checkbox"/> Offline <input type="checkbox"/> Online <input type="checkbox"/> Blended <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Training Delivery Mode</th> <th>Theory (Hours)</th> <th>Practical (Hours)</th> <th>Total (Hours)</th> </tr> </thead> <tbody> <tr> <td>Classroom (offline)</td> <td>30</td> <td>30</td> <td>60</td> </tr> </tbody> </table> <p>Training shall be conducted in any of the 3 modes depending on the regional need. (Refer Blended Learning Annexure-V for details)</p>			Training Delivery Mode	Theory (Hours)	Practical (Hours)	Total (Hours)	Classroom (offline)	30	30	60
Training Delivery Mode	Theory (Hours)	Practical (Hours)	Total (Hours)									
Classroom (offline)	30	30	60									
12.	<b>Assessment Criteria</b>	Theory (Marks)	Practical (Marks)	Project/ Presentation /Assignment (Marks)	Viva/ Internal Assessment (Marks)	Total (Marks)	Passing %age					
	100	60	20	20	200	50						
13.	<b>Is the NOS Amenable to Persons with Disability</b>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If "Yes", specify applicable type of Disability: <ul style="list-style-type: none"> <li>a. Locomotor Disability: Leprosy Cured Person, Dwarfism, Muscular Dystrophy and Acid Attack Victims</li> <li>b. Visual Impairment: Low Vision</li> </ul>										

14.	<b>Progression Path After Attaining the Qualification, wherever applicable</b>	Embedded Software Engineer	
15.	<b>How will the participation of women be encouraged?</b>	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.	
16.	<b>Other Indian languages in which the Qualification &amp; Model Curriculum are being submitted</b>	Qualification file available in English & Hindi Language.	
17.	<b>Is similar NOS available on NQR-if yes, justification for this qualification</b>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
18.	<b>Name and Contact Details Submitting / Awarding Body SPOC</b> <i>(In the case of CS or MS, provide details of both Lead AB &amp; Supporting ABs)</i>	<p>Name: Rajesh M  Email: rajesh.m@nielit.gov.in  Website: <a href="https://nielit.gov.in/">https://nielit.gov.in/</a></p> <p>Name: Anirban Jyoti Hati  Email: anirban@nielit.gov.in  Website: <a href="https://nielit.gov.in/">https://nielit.gov.in/</a></p> <p>Name: Ankit Kumar  Email: ankit@nielit.gov.in  Website: <a href="https://nielit.gov.in/">https://nielit.gov.in/</a></p>	
19.	<b>Final Approval Date by NSQC: 25.07.2024</b>	<b>20. Validity Duration: 3 years</b>	<b>21. Next Review Date: 25.07.2027</b>

### Section 2: Training Related

1.	<b>Trainer's Qualification and experience in the relevant sector (in years) (as per NCVET guidelines)</b>	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 & Medical Electronics
2.	<b>Master Trainer's Qualification and experience in the relevant sector (in years) (as per NCVET guidelines)</b>	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 Systems & Medical Electronics
3.	<b>Tools and Equipment Required for the Training</b>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Available at Annexure-II
4.	<b>In Case of Revised NOS, details of Any Upskilling Required for Trainer</b>	Not Applicable

### Section 3: Assessment Related

1.	<b>Assessor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)</b>	B.Tech or Equivalent as per NCrF + 3 years relevant experience
2.	<b>Proctor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines), (wherever applicable)</b>	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.	<b>Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)</b>	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.	<b>Assessment Mode</b> (Specify the assessment mode)	Centralized online examination will be conducted
5.	<b>Tools and Equipment Required for Assessment</b>	Same as for training <input checked="" type="checkbox"/> Yes <input type="checkbox"/> 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: 8
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.	<b>Annexure:</b> NCrF/NSQF level justification based on NCrF/NSQF descriptors <i>(Mandatory)</i>	Available at Annexure-I: Evidence of Level
2.	<b>Annexure:</b> List of tools and equipment relevant for NOS <i>(Mandatory, except in case of online course)</i>	Available at Annexure-II: Tools and Equipment
3.	<b>Annexure: Industry Validation</b>	Available at Annexure-III: Industry Validation
4.	<b>Annexure: Training Details</b>	Available at Annexure-IV: Training Details
5.	<b>Annexure:</b> Blended Learning <i>(Mandatory, in case the selected Mode of delivery is Blended Learning)</i>	Available at Annexure-V: Blended Learning
6.	<b>Annexure/Supporting Document:</b> Standalone NOS- Performance Criteria Details Annexure/Document with PC-wise detailing as per NOS format <i>(Mandatory- Public view)</i>	Available at Annexure-VI: Standalone NOS- Performance Criteria details
7.	<b>Annexure:</b> Performance and Assessment Criteria <i>(Mandatory)</i>	Available at Annexure-VII: Detailed Assessment Criteria
8.	<b>Annexure:</b> Assessment Strategy <i>(Mandatory)</i>	Available at Annexure-VIII: Assessment Strategy
9.	<b>Annexure:</b> Acronym and Glossary <i>(Optional)</i>	Available at Annexure-IX: Acronym and Glossary

10.	<b>Supporting Document:</b> Model Curriculum	Available at Annexure-C: Model Curriculum
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### 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
<b>Professional Theoretical Knowledge/Process</b>	<ul style="list-style-type: none"> <li>Understanding of the specific needs and constraints of medical electronic systems, enabling the design of effective and efficient devices.</li> <li>Capability to design and develop medical devices that meet regulatory requirements, ensuring patient safety and product efficacy.</li> <li>Proficiency in selecting and utilizing appropriate development platforms for specific medical applications.</li> </ul>	<ul style="list-style-type: none"> <li>Applying theoretical knowledge to analyze and address these needs and constraints during the design phase, ensuring the devices are tailored to meet specific medical applications effectively and efficiently.</li> <li>Implementing design and development processes that adhere to regulatory guidelines, performing necessary testing and validation, and documenting compliance to ensure patient safety and product efficacy.</li> </ul>	5
<b>Professional and Technical Skills/Expertise/Professional Knowledge</b>	<ul style="list-style-type: none"> <li>Demonstrated expertise in selecting and utilizing appropriate development platforms and components for medical applications.</li> <li>Candidate should be proficient in integrating medical sensors and instrumentation with embedded systems and developing algorithms for accurate data analysis and interpretation.</li> <li>Candidate should ensure that the medical electronic devices are compliant with relevant standards and are optimized for power efficiency.</li> </ul>	<ul style="list-style-type: none"> <li>This outcome requires proficiency in evaluating and selecting development platforms and components specific to medical electronics. It involves a deep understanding of the key features, specifications, and capabilities of various development boards and specialized platforms available for medical applications.</li> <li>The expertise here centers on the ability to seamlessly integrate diverse sensors into embedded systems, ensuring accurate data capture and processing.</li> </ul>	5

<b>Employment Readiness &amp; Entrepreneurship Skills &amp; Mind-set/Professional Skill</b>	<ul style="list-style-type: none"> <li>Candidates will be able to ensure that medical devices meet all necessary compliance standards, a crucial skill for employment in medical electronics companies and for launching medical devices as an entrepreneur.</li> <li>Candidates will have the technical expertise to develop innovative medical electronic devices, improving employability and enabling entrepreneurial ventures in the healthcare technology sector.</li> <li>Candidates will be equipped to lead and manage product development projects, from concept to deployment, enhancing their readiness for employment and providing a strong foundation for entrepreneurship in medical electronics.</li> </ul>	<ul style="list-style-type: none"> <li>Demonstrating the ability to ensure compliance with regulatory standards enhances a candidate's readiness for employment in medical electronics companies.</li> <li>Possessing technical expertise in developing innovative medical devices boosts candidates' employability, as companies seek individuals who can drive product innovation and development in the competitive healthcare technology sector.</li> <li>The ability to lead and manage product development projects positions candidates for entrepreneurship by equipping them with the skills to oversee the entire product lifecycle, from ideation to deployment.</li> </ul>	5
<b>Broad Learning Outcomes/ Core Skill</b>	<ul style="list-style-type: none"> <li>Candidates should possess an expert level of competence in signal processing techniques specifically tailored for medical data, including filtering, feature extraction, and analysis.</li> <li>Candidates should demonstrate proficiency in utilizing and adapting specialized medical electronics development platforms and boards for the design and implementation of medical devices.</li> <li>Candidates should be proficient in designing and implementing wireless communication systems tailored to medical electronics applications.</li> </ul>	<ul style="list-style-type: none"> <li>Signal processing expertise is fundamental in medical electronics, as it directly impacts the accuracy and reliability of medical data analysis and interpretation. Candidates must possess an in-depth understanding of filtering, feature extraction, and analysis tailored for medical data to fulfill this requirement.</li> <li>Core skill encompasses the ability to leverage the features, specifications, and capabilities of these platforms to develop and implement medical devices effectively.</li> </ul>	5
<b>Responsibility</b>	<ul style="list-style-type: none"> <li>Key responsibility is to prioritize the safety and reliability of medical electronics systems. Professionals must demonstrate a commitment to designing and implementing electronic systems that operate reliably and safely within healthcare environments.</li> <li>Professionals need to exhibit a strong sense of responsibility towards adhering to medical device quality and regulatory standards.</li> </ul>	<ul style="list-style-type: none"> <li>Prioritizing the safety and reliability of medical electronics systems entails a commitment to designing and implementing systems that operate securely and consistently, with a clear focus on patient well-being and the effective delivery of healthcare services.</li> <li>Adhering to medical device quality and regulatory standards involves ensuring that all electronic</li> </ul>	5

systems and devices meet the necessary quality and safety benchmarks, as set by regulatory bodies and industry standards, to safeguard patient health and maintain compliance with legal requirements.

### 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 & Tools	Medical electronics development boards, medical sensors, signal processing software, compliance testing equipment, wireless communication modules, human-machine interface development tools, and access to relevant documentation and standards.	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	Aajivika Global Skill Private Limited	Mukesh Kumar Verma	Director	Beside Vishal Trade, dasmille chowk, Khunti Road Ranchi, Jharkhand-835221	9507952882	<a href="mailto:aajivikaglobal@gmail.com">aajivikaglobal@gmail.com</a>
2	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	<a href="mailto:Teena.panthi@aisect.org">Teena.panthi@aisect.org</a>
3	B. G. Infotech	Amal Das	Centre Head	Kakdihi, Mecheda, Purba, Medinipur	9434996748	<a href="mailto:Bginfotech2007@gmail.com">Bginfotech2007@gmail.com</a>
4	Devendra Nath Institute of Information Mation Technology (DNIIT)	Amit Kumar Tripathy	Director	Uska Road, Near Naveen Sabji Mandi, Tetari Bazar, Siddharth Nagar-272207	8765562815	<a href="mailto:aktjob@gmail.com">aktjob@gmail.com</a>
5	Inditech Software Wizard Pvt. Ltd.	Sandip Ghosh	Course Coordinator	Mohiari Chanpiritala, Po: Andul Mouri, PS: Domjur, Distt: Howrah, West Bengal-711302	9230027415	<a href="mailto:swizardrecruitment@gmail.com">swizardrecruitment@gmail.com</a>
6	Prasanthi Polytechnic	D. Prasad	Principal	Duppituru (Vill), Atchutapuram (Md). Visakhapatnam (Dist), Andhra Pradesh-531011	9849952573	<a href="mailto:prasadreddy.1279@gmail.com">prasadreddy.1279@gmail.com</a>
7	Sidhi Vinayak Academy	Neha Verma	Director	Shiv Narayan Kunj, B Block, Shivaji Nagar, Hethu, Ranchi, JH-834002	8789837772	<a href="mailto:sidhiacadmey@gmail.com">sidhiacadmey@gmail.com</a>
8	Surekha IT Services	Anjani K	Manager	8-3-191/84/302, Sharan Residency, Vengalrao Nagar, Hyderabad-500038, Telangana	8125134134	<a href="mailto:info@surekhaitservices.com">info@surekhaitservices.com</a>

**Annexure IV: Training Details****Training Projections:**

Year	Estimated Training # of Total Candidates	Estimated training# of Women	Estimated training# of People with Disability
2024-25	500	200	20
2025-26	500	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 Software 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 Software 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	Virtual Software Platform	Either 100% online in a virtual environment

		Or 100% offline in the Industry.
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## Annexure VI: Standalone NOS- Performance Criteria details

### 1. Description

This NOS provides a comprehensive overview of the critical role of electronic technology in healthcare. Students will delve into the unique challenges and regulatory landscape of medical electronics, exploring the intricacies of medical device development boards, sensor applications, signal processing techniques, and wireless communication systems.

### 2. Scope

This course equips learners to design and innovate medical devices, fostering a deep understanding of human-machine interfaces and the practical application of these skills in medical monitoring, diagnosis, and treatment projects.

### 3. Elements and Performance Criteria

#### *Medical Device Regulations and Standards*

- Students should be able to describe the key regulatory bodies (e.g., FDA, ISO) and their roles in medical device approval.
- Students should develop a compliance plan for a medical device, ensuring it meets all necessary legal and safety standards.
- Students should stay informed about and critically evaluate recent changes or updates in medical device regulations.

#### *Medical Sensors and Instrumentation*

- Students should select appropriate sensors for specific medical applications based on functionality and requirements.
- Students should successfully interface sensors with microcontrollers or development boards.
- Students should analyze sensor data to extract meaningful information, such as detecting abnormalities in medical readings.

#### *Signal Processing Techniques for Medical Data*

- Students should develop feature extraction algorithms to identify key characteristics in medical data.
- Students should design systems capable of providing immediate feedback based on processed medical data.

- Students should validate their algorithms by comparing results with established benchmarks or clinical data.

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

The individual on the job needs to know and understand:

- Understanding regulatory frameworks and compliance standards (FDA, ISO) for medical device development.
- Grasping medical sensor technology, device interfaces, signal processing techniques, and data analysis methods.
- Familiarity with hardware-software integration, wireless communication protocols, human-machine interface design, and system-level development for medical devices.

#### 5. Generic Skills (GS):

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

- Effective communication skills for collaborating with interdisciplinary teams and stakeholders.
- Critical thinking and problem-solving abilities for addressing complex challenges in medical electronics.
- Time management and project management skills for meeting deadlines and delivering quality outcomes in medical device development.

#### 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: Essentials of Embedded System for Medical Electronics	<i>Medical Device Regulations and Standards</i>	30	20	-	6
	Students should be able to describe the key regulatory bodies (e.g., FDA, ISO) and their roles in medical device approval.	-	-	-	-
	Students should develop a compliance plan for a medical device, ensuring it meets all necessary legal and safety standards.	-	-	-	-

<b>NOS Code: NIE/ELE/N0230</b>	Students should stay informed about and critically evaluate recent changes or updates in medical device regulations.	-	-	-	-
	<i>Medical Sensors and Instrumentation</i>	40	20	-	7
	Students should be able to describe the key regulatory bodies (e.g., FDA, ISO) and their roles in medical device approval.	-	-	-	-
	Students should develop a compliance plan for a medical device, ensuring it meets all necessary legal and safety standards.	-	-	-	-
	Students should stay informed about and critically evaluate recent changes or updates in medical device regulations.	-	-	-	-
	<i>Signal Processing Techniques for Medical Data</i>	30	20	-	7
	Students should develop feature extraction algorithms to identify key characteristics in medical data.	-	-	-	-
	Students should design systems capable of providing immediate feedback based on processed medical data.	-	-	-	-
	Students should validate their algorithms by comparing results with established benchmarks or clinical data.				
		100	60	20	20
<b>NOS Total</b>		<b>200</b>			

#### Annexure VIII: 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 IX: Acronym and Glossary

#### Acronym

Acronym	Description
<b>AA</b>	Assessment Agency
<b>AB</b>	Awarding Body
<b>NCrF</b>	National Credit Framework
<b>NOS</b>	National Occupational Standard(s)
<b>NQR</b>	National Qualification Register
<b>NSQF</b>	National Skills Qualifications Framework

#### Glossary

Term	Description
<b>National Occupational Standards (NOS)</b>	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.
<b>Qualification</b>	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
<b>Qualification File</b>	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.
<b>Sector</b>	A grouping of professional activities on the basis of their main economic function, product, service, or technology.