

QUALIFICATION FILE – CONTACT DETAILS OF 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

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Position in the organization	:	Joint Director (Technical)
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List of documents submitted in support of the Qualifications File

1. Annexure 1: Model Curriculum
2. Annexure 2: Evidence of need

SUMMARY

1	Qualification Title:	Repair and Maintenance Assistant (X-Ray & Ultrasound Machine)
2	Qualification Code	
3	NCO code and occupation	Not available
4	Nature and purpose of the qualification (Please specify whether qualification is short term or long term)	<p>Nature:</p> <ul style="list-style-type: none"> ❖ Assiatnt Technician level Course which will help in employment in the area of repair & maintenance of basic hospital imaging equipment.. <p>Purpose:</p> <ul style="list-style-type: none"> ❖ To get unemployed youth to jobs. ❖ To upgrade the skills of incumbent already in work in the field of repair of medical imaging electronic equipment. ❖ Entrepreneurship development.
5	Body/bodies which will award the qualification	National Institute of Electronics and Information Technology (NIELIT) 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	X-Ray & Ultrasound Repair and Maintenance Assistant
9	Job description of the occupation	Repair & maintenance technical assistant for Imaging Equipment (X Ray And Ultrasound)

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10	Licensing requirements	NA
11	Statutory and Regulatory requirement of the relevant sector (documentary evidence to be provided)	330 Theory: 120 Practical: 150 Employability Skill : 30 OJT: 30
12	Level of the qualification in the NSQF	Level-3
13	Anticipated volume of training/learning required to complete the qualification	330 Hours
14	Indicative list of training tools required to deliver this qualification	Multimeters, Soldering Iron, power supply, Serew Driver sets, pliers, Cutters, wires, equipment for repairs
15	Entry requirements and/or recommendations and minimum age	10th Pass Or 8th Class Pass and pursuing continuous regular schooling Or 8th Class Pass + 2 Years ITI in relevant field Or 8th Class Pass + 1 Year of Experience in relevant field Or NSQF Level 2 with 1 Year of Experience in relevant field
16	Progression from the qualification (Please show Professional and academic progression)	Professional: Technician ->Sr. Technician -> Service Engineer ->Entrepreneur Academics: Higher Level Courses in Medical Electronics
17	Arrangements for the Recognition of Prior learning (RPL)	► The candidates who will undergo such training shall be accessed through viva/ Written exam ► Later on, candidate can appear for advanced level of courses or related courses in the field of servicing/repairs.

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18	International comparability Where known (research evidence to be provided)	NA
19	Date of planned review of the Qualification.	28/07/2025

20	Formal structure of qualification
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Sl. no.	Module Name	Estimated Size (Learning Hours)	Level
1.	Tools DC & AC Electricity Test & Measuring instruments	15	3
2.	Passive components	25	3
3.	Active Components	45	3
4.	Soldering and Disorders	20	3
5.	Bio-Medical Instrumentation and Measurement	40	3
6.	X-Ray Machine	90	3
7.	Ultrasound machine	35	3
8.	Employability Skills	30	3
9.	On Job Training	30	3
	Total Hours	330	3

Detail Curriculum attached at **Annexure I**.**SECTION -1****ASSESSMENT**

21	Body/Bodies which will carry out assessment: The Examination Section 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?

	<p>The candidates who will undergo such training shall be assessed through viva only. Later on, candidate can appear for advanced level of course if they fulfill entry requirements there</p>
<p>23</p>	<p>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.</p> <p>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.</p> <p>The Following assessment methodologies are used.</p> <p>A. Written Assessment (Multiple Choice Questions) Practical Assessment & class Performance The assessment results are backed by following evidences :-</p> <ol style="list-style-type: none"> 1. The assessor collects a copy of the attendance for the training done under the scheme. The attendance sheets are signed and stamped by the In-charge / Head of the Training Centre. 2. The assessor verifies the authenticity of the candidate by checking the photo ID card issued by the institute as well as any one Photo ID card issued by the Central/Government. The same is mentioned in the attendance sheet. 3. The assessor assigns roll number. <p>B. The assessor takes photograph of all the students along with the assessor standing in the middle and with the centre name/banner at the back as evidence.</p>

24. ASSESSMENT EVIDENCE

Outcomes to be assessed	Assessment Criteria for the outcome	Means of Assessment		
		Total Marks	Written	Practical

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Handling & Efficient use of repairing Tools, Testing & Measuring Equipments, Electrical & electro-mechanical	1. Learn the Use of CRO & Multimeter, 2. Study & analysis of different types of waveforms on CRO 3. Identification of Different types of mechanical & electromechanical components 4. Learn about Electromagnetic Relays, Rechargeable cells, batteries etc.	15	06	09
Soldering & De-soldering Components.	Soldering & De Soldering of components. Identification of passive components. Testing of components. Measurement of values of Resistor, Capacitor, Inductors using Color Coding. Identification & testing of active components like semiconductors Diode, Zener Diodes, LED's. Transistors. MOSFET, Pin identification & numbering convention in ICs and their usage.	20	8	12
Will the incumbent be able to install, operate & use of various controls of X-Ray Machine used in hospitals and will be able to identify & repair faults	1. He will be familiar with various terminology - time, distance, mA, mA-s central-ray, wavelength, collimator, aluminum filtration etc. 2. Will be able to locate different sections of x-ray machine. Identify components in different section. 3. Installation of x ray machine. Identify faults in a particular section. Can replace parts if required. 4. He can see function testing, measurement of milli amperes, etc	20	09	11

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<p>What will the incumbent be able to operate, use and in maintaining the Ultrasonic scanner</p>	<p>Use and construction of transducer. Identification of various blocks/parts in the machine. Check of power supply Functioning & working of equipment. Use and functions of panel controls, Mode of operation- 2D- mode, M mode, Doppler(color and spectral) etc. Handling of probe & other attachments. Use of Ultrasonic scanners in various applications- Radiology, cardiology, vascular and OB/GYN. Use of probe for different applications use of diagnostic tools.</p>	20	8	12
<p>Communication clearly with clients & colleagues and Employability Skills</p>	<p>Communication /Interaction with colleagues, seniors and clients. Preparation of Job reports.</p>	8	4	4
<p>Repair / servicing of equipment & identification , rectification of fault and related Safety Procedures</p>	<p>1.Fault finding by using specified steps 2.Interpret progress of fault rectification 3.Use of appropriate tools to rectify & repair the fault</p>	17	2	15
<p style="text-align: center;">Grand Total</p>		100	37	63

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Means of Assessment:-

Online assessments carried out using multiple-choice question formats applicable for the course & practical skills

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Online assessments carried out using multiple-choice question formats applicable for the course & practical skills.

Sl No	Examination Pattern	Modules Covered	Duration in Minutes	Maximum Marks
1	Theory Paper – 1: Basics of Biomedical Equipments	1-4	90	100
2	Theory Paper – 2: Repair and Maintainance of X-Ray & Ultrasound Machine	5-7	90	100
3	Practical -1: Repair and X-Ray & Ultrasound Machine Practices	1-7	180	90
4	Internal Assessment	1-7	-	30
5	OJT/ Project	1-7	-	30
	Total			350

Pass/Fail

Following Grading Scheme (on the basis of total marks) will be followed:

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 %)	$\geq 85\%$	$\geq 75\%$ and $< 85\%$	$\geq 65\%$ and $< 75\%$	$\geq 55\%$ and $< 65\%$	$\geq 50\%$ and $< 55\%$

3. The OJT and Employability Skills will be assessed by concerned NIELIT Centre itself.

***Assessment for the Qualification will be conducted as per the guidelines as applicable from time to time.**

SECTION 2

25. EVIDENCE OF LEVEL

Level of Qualification: 3

Title/Name of Qualification /Component: Repair and Maintenance Assistant (X-Ray & Ultrasound Machine)			
NSQF Domain	Outcomes of the Qualification/Component	How the Job role relates to the NSQF level descriptor	NSQF Level
Process	Tools, Test & Measuring Equipments ,Electrical & electromechanical components & user skill	After this portion of course the candidate will get all the skills for the efficient use of various tools required for repair & servicing. He will also have a knowhow about the use of Test & Measuring Equipments & electromechanical components used in various equipments	3
Professional Knowledge		After acquiring Professional Knowledge on use of tools ,He will be able to open the equipment confidently & identify the various components used in the system	3
Professional Skill		After acquiring the professional skill the candidate will have sufficient practical knowledge of the tools & use of various Test & Measuring Equipments	3
Core Skill		After acquiring core skill the student will have the knowledge about the efficient use of various equipments used in the repair purposes	3
Responsibility		The candidate will learn how to work in a group .	3

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Process	Components: Passive & Active ,ICs, Component identification, Soldering & De-soldering Skills	After this portion of course the candidate will get all the skills for the identification & testing of electronic components both active and passive along with the general purpose IC. He will also have skills to do the soldering & de-soldering of the PCBs.	3
Professional Knowledge		After acquiring Professional Knowledge about Soldering & De-Soldering candidate will have all factual and theoretical knowledge regarding actual repairs, identify the faulty components & replace them.	3
Professional Skill		After acquiring Professional skill on Soldering & De-Soldering Skills candidate will learn how to perform the process of soldering & de-soldering & can professionally take out the job.	3
Core Skill		After acquiring Core skill on Soldering & De-Soldering and about the components the candidate will have the theoretical as well as the practical knowledge about the soldering techniques & de-soldering of components	3
Responsibility		After acquiring knowledge on Soldering & De-Soldering Skills the candidate can take out the job of repairs as a technician.	3

Process		In Learning theory about the X Ray machine the candidate will have knowledge about various controls of X-Ray Machines used in our hospitals Their usage and their main faults.	3
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Professional Knowledge	Imaging Equipment X-Ray Machine	After acquiring Professional Knowledge the candidate will be able to handle & take care of the general maintenance of an X Ray machine.He will be able to locate the general faults & can rectify them	3
Professional Skill		After acquiring Professional Knowledge the candidate will be able to locate the different sections of an X Ray machine & be able to identify the fault in a particular section	3
Core Skill		After acquiring Core skill on Repairing the incumbent will be able to operate the machine ,locate faults in various sections & if parts available can replace them	3
Responsibility		The candidate can work in X Ray lab as technician & can rectify the general faults occurring frequently	3

Process		In Learning Ultrasonic scanner the candidate will learn both theoretical & practical knowledge about the functioning of the equipments.	3
Professional Knowledge		After acquiring Professional Knowledge .the candidate will be able to operate & have knowledge about various controls of an Ultrasound machine	3

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Professional Skill	Imaging Equipment Ultrasonic scanner	The Professional skill will be that the candidate will be able to operate & have knowledge about various controls of an Ultrasonic machine. How to handle the probes & their safety	3
Core Skill		As core skill the incumbent will be able to check the general faults occurring with the machines , loose connections, probe attachment & its safety.	3
Responsibility		The candidate will be responsible for the general maintenance of machine and its repairs	3
Process	Enhancing Communication Skills	In Learning Enhancing Communication Skills candidate carries out well developed skills for improving communication skills. They will also learn broad range of techniques for appearing before interview board.	3
Professional Knowledge		After acquiring Professional Knowledge on Enhancing Communication Skills candidate will have sufficient knowledge of facts and principles adopted, co-ordination & behavior with the clients	3
Professional Skill		After acquiring Professional skill on Enhancing Communication Skills candidate will have sufficient knowledge about cognitive and practical skills required to enhance their communication skills.	3

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Core Skill		After acquiring Core skill on the subject the candidate will be able to communicate with the clients & will learn logical communication skills.	3
Responsibility		After acquiring Professional skill on Enhancing Communication Skills candidate will learn how to be responsibility for own work and how to help others in group.	3
Process	Troubleshooting Skills, Safety & Security Procedures	The candidate will be given the logical tips to troubleshoot a particular equipment. What will be the different safety procedures to be maintained during repairs	3
Professional Knowledge		After acquiring Professional Knowledge on troubleshooting skills the candidate will have a knowhow of general fault finding , earthing & security against electrical shocks	3
Professional Skill		After acquiring Professional skill candidate will have knowledge about Trouble shooting ,safety procedures taken while on job & importance of earthing	3
Core Skill		The incumbent will be able to check the general faults occurring with the equipments &logical faults will be carried out by him.	3
Responsibility		The candidate will get enough knowledge to install an equipment ,use with patient & check the general faults	3

SECTION 3**EVIDENCE OF NEED**

<p>26</p>	<p>What evidence is there that the qualification is needed?</p> <p>Bio Medical technicians contribute enormously to the patient care by repairing, maintaining, calibrating & installing various test & measuring equipments existing in hospitals these days. Healthcare services in the country have drastically improved even at the block level. Numerous equipments are being installed in hospitals as testing, measuring & diagnostic aids. However it has been observed that the downtime of the equipments is growing at an alarming rate due to the absence of adequate repair & servicing set-up. This affects the patient care. Thus people need to be trained in the field of biomedical equipment repairs, so as to improve the capacity utilization ,overall healthcare facilities & at the same time benefit practicing engineers, technicians,& fresher's in their skill up gradation.</p> <p>The proposed course will result in reducing the downtime of hospital equipment by increasing their availability. The facility will ensure prompt repairs of faulty equipment to be attended locally, where there is dearth of trained manpower & has to be flown in from the other parts of the country</p>
<p>27</p>	<p>What is estimated uptake of this qualification and what is the basis of this estimate?</p> <p>Estimated uptake is 25 students / Batch / centre and on the basis of Facilities and Infrastructure available in respective NIELIT Centres</p>
<p>28</p>	<p>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</p> <p>Similar Qualification does not exist as per information available in NQR portal.</p>
<p>29</p>	<p>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</p> <p>The Qualification is to be monitored and reviewed every three years. The following data will be used.</p> <ul style="list-style-type: none"> ❖ Constant interaction & feedback of local health services department ❖ Results of assessments ❖ Employer feedback will be sought post-placement ❖ Student feedbacks ❖ Workshops and seminar for reviewing the qualifications ❖ Consultation/ Tie-up with self help groups, Industries , Expert for review of the Curriculum so as to meet the changing pace of technology and general

	health care requirements.
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SECTION 4

EVIDENCE OF PROGRESSION

30	<p>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?</p> <p>After skilling himself through this certification course the incumbent can either start his own enterprise or get associated with any hospital/health centre/Diagnostic Lab. NIELIT shall facilitate forming of small manageable self help groups of such Qualifiers & introduce them at various levels in the health services set-up to establish their repair & se servicing business. They shall also be encouraged to take up higher level courses in furtherance of their skill in repair & maintenance of hospital equipments.</p>
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SECTION 5

EVIDENCE OF INTERNATIONAL COMPARABILITY

List any Comparisons which have been established

Bio-Medical engineering courses have been introduced at the undergraduate /post-graduate in various technical institutions. This will be the best bio-medical technician level skill certificate for further progression to a candidate.

Voluntary certifications such as

Certified Biomedical technician (CBET),

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Certified Laboratory Equipment Specialist (CLES),

Certified Radiology Equipment Specialist (CRES) are offered by institutions which are accredited to **Medical Equipment & Technicians Association (META) ,USA.**

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