QUALIFICATION FILE–Standalone NOS

3D Printing: Design and Development Fundamentals

☐ 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: 3.5

Submitted By:

National Institute of Electronics and Information Technology (NIELIT)

NIELIT Bhawan, Plot No. 3, PSP Pocket, Sector-8,
Dwarka, New Delhi-110077,
Phone:- 91-11-2530 8300
e-mail:- contact@nielit.gov.in

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Section 1: Basic Details

<table>
<tr><td>1.</td><td>NOS-Qualification Name</td><td colspan="2">3D Printing: Design and Development Fundamentals</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-3.5-EH-02638-2024-V1-NIELIT</td><td>5. NCrF/NSQF Level: 3.5</td></tr>
<tr><td>6.</td><td>Brief Description of the Standalone NOS</td><td colspan="2">The standalone NOS “3D Printing: Design and Development Fundamentals” has been designed in collaboration with GROK Learning Pvt Ltd. This NOS offers an in-depth exploration of the fundamentals of design and additive manufacturing, with a focus on 3D printing technology. Participants will gain a comprehensive understanding of the significance of 3D printing across various industries. Practical aspects, such as modeling using software, slicing parameters, and operating a 3D printer, including parts identification, safety precautions, and troubleshooting techniques, will be covered. The program equips students with design, problem-solving, and entrepreneurship skills.</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>1st year of 3-year diploma after 10th in Electronics and Commutation Engineering/ Electrical Engineering/ Computer Science/ Information Technology/ allied branches</td><td>NA</td></tr>
<tr><td>2</td><td>11 or equivalent</td><td>NA</td></tr>
<tr><td>3</td><td>10th grade pass and pursuing continuous schooling</td><td>NA</td></tr>
<tr><td>4</td><td>8th grade pass with two years of NTC plus 1 year</td><td>NA</td></tr>
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<table>
<tr><td></td><td></td><td>
<table>
<tr><td></td><td>NAC/CITS</td><td></td></tr>
<tr><td>5</td><td>NSQF Level 3 in Electronics and Commutation Engineering/ Electrical Engineering/ Computer Science/ Information Technology/ allied branches</td><td>1.5 year relevant experience</td></tr>
</table>
b. Age:18
</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 Credits</td><td>9. Common Cost Norm Category (I/II/III) (wherever applicable):
I (Electronics System Design)</td></tr>
<tr><td>10.</td><td>Any Licensing Requirements for Undertaking Training on This Qualification (wherever applicable)</td><td colspan="2">The open source resources can be used.

Annual subscription-based license to access cloud platform may also be purchased.</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 colspan="2">☒ 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>15</td><td>45</td><td>60</td></tr>
</table>
The mode of delivery shall be based on the regional demand and can be offered in any of the above modes mentioned.</td></tr>
<tr><td>12.</td><td>Assessment Criteria</td><td colspan="2">
<table>
<tr><th>Theory (Marks)</th><th>Practical (Marks)</th><th>Project (Marks)</th><th>Viva (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 centralised online assessment is conducted by the Examination Wing, NIELIT Headquarters.</td></tr>
</table>

13.	**Is the NOS Amenable to Persons with Disability**	☒ **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	
14.	**Progression Path After Attaining the Qualification, wherever applicable**	3D Printing Technician	
15.	**How will the participation of women be encouraged?**	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.	**Other Indian languages in which the Qualification & Model Curriculum are being submitted**	Qualification files available in English & Hindi Language.	
17.	**Is similar NOS available on NQR-if yes, justification for this qualification**	☐**Yes** ☒ **No**	
18.	**Name and Contact Details Submitting / Awarding Body SPOC** *(In the case of CS or MS, provide details of both Lead AB & Supporting ABs)*	**From NIELIT** Name: Saket Saurabh Email: srv.saket@nielit.gov.in Contact No:011-25308300 Website: https://nielit.gov.in **From GROK** Name: Grok Learning Email: enquiry@grokstem.com	
19.	**Final Approval Date by NSQC: 30.05.2024**	**20. Validity Duration: 3 years**	**21. Next Review Date: 30.05.2027**

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 Electrical/Electronics/IT/Comp. Sc. With 2 Years of relevant industry Experience and 1 year of teaching experience Diploma in Electrical/Electronics/IT/Comp.Sc With 3 Years of relevant industry Experience and 2 year of teaching experience
2.	**Master Trainer's Qualification and experience in the relevant sector (in years) (as per NCVET guidelines)**	B.E./B.Tech in Electrical/Electronics/IT/Comp. Sc. With 3 Years of relevant industry Experience and 1 year of teaching experience
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)*	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), (wherever applicable)*	
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.
2.	Number of Industry validations provided: 18
3.	Estimated number of people to be trained: 1000 persons per year shall be trained.
4.	Evidence of Concurrence/Consultation with Line/State Departments (In case of regulated sectors): No. **NIELIT is recognized as AB and AA under the Government Category. NIELIT is the HRD arm of MeitY, GoI.**

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: Performance Criteria
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	• Proficiency in product design principles and techniques. • Mastery of 3D printing technologies and their application in product prototyping and manufacturing. • Ability to design and prototype products using 3D printing technology for various industries.	An efficient 3D Printing expert familiar with the process of ideation, modeling, slicing and 3D Printing will have variety of skill sets required to solve real world problems faced across industry verticals in the area of product design and prototyping	3.5
Professional and Technical Skills/ Expertise/ Professional Knowledge	Effectively apply concepts to build 3D Printed prototypes/designs for different industries. Develop new models to address a real-life use case.	Individuals completing this qualification are likely to possess the expertise required for roles in the field of product design & prototyping with 3D Printing	3.5
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	Emphasis on what industries are expecting from them as a skill to build, through applied learning and execution platform to become problem solvers with critical thinking, thought leaders, innovators, and job creators. Ability to transform ideas into real-life solutions using technological tools. Entrepreneurial ability to launch their own business /service.	After completing this program students will be in a better position to fulfill expectations from industry that offers unique opportunities for career development in this exciting field.	3.5
Broad Learning Outcomes/ Core Skill	Individuals with 3D Printing skills will contribute to organizational success in different companies using 3D Printing	This program prepares the candidates to adapt to current industry demands.	3.5

Responsibility	Able to design new 3D Printing applications for different industry verticals	Takes complete responsibility for delivery and quality of own work and output as also the subordinates. Shares responsibility for the group tasks.	3.5

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.)	1
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 processors with at least 8GB RAM, 512GB SSD Hard disk integrated with graphics card, Display size 15.6 inch, Wifi connectivity and Wired Optical Mouse.	15
5	Cloud Based 3D Printing Infrastructure	3D Modeling Software, Slicing Software	Should support multiple concurrent logins.
6	Hardware	3D Printer supporting FDM process, 3D Printed models & articles, 3D Printing Filament (consumable)	2
7	Industry applications	• Consumer – Geometric Connector • Healthcare – Contactless Key • Jewelry – Pendant • Dice • Ball Joint • Geometric Connector(Pipes) • Hinge	5

		• Water Tank • ATV Knuckle • Raspberry Pi Case	
8	Internet Connectivity	Seamless internet connectivity with at least 100 Mbps without firewall	

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	B G Infotech	Amal Das	Centre Head	Kakdihi, Mecheda, Purba Medinipur	9434996748	bginfotech2007@gmail.com
2	Elite Computers and Communications Pvt. Ltd.	Hrishikesh Sarma	Sr. sales executive	Sohum Residency, 1st Floor, R.G. Baruah Road, Near Sundarpur Bus-Stop, Above Jeep Show Room, Guwahati- 781005, Assam	9854054283	info@eccpl.co.in
3	INDITECH SOFTWARE WIZARD PVT. LTD	Sandip Ghosh	Course Coordinator	Mohiary Chanpiritola, P.O.-Andul-Mouri, P.S. Domjur, Dist-Howrah, WB-711302	9230027415	swizardrecruitment@gmail.com
4	JHARKHAND GOVERNMENT	M.K. Gupta	Principal	Plot No: 38, Phase-I, Tatisilwai Industrial Area, Tatisilwai, Ranchi-	9431129589	principal@jgmsmetr.com

	TOOL ROOM			835103		
5	L&T Skill Trainers Academy	B A Damahe	Head L&T STA	Madh Campus, Near Custom House, Versova Creek Madh Jetty Madh, Mumbai-400061, India	9833078355	bhuvan.damahe@larsentoubro.com
6	M/S Peleecon Linker	Milind R. Heblli	PROPRIETOR	213, Krishna, Laxmi Industrial Complex, Pokhran Road No. 1, Vartaknagar, Thane (W)- 400606	9820095454	Milindhebli66@gmail.com
7	Process Precision Instruments	Jay Jain	Business Development Head	101 Diamond Industrial Estate, Navghar, Vasai Road (E), Palghar401210, Maharashtra	9930880079	jayjain@ppiindia.net
8	PRO PLATERS LLP	Rajesh Dattaram Kesarkar	Partner	PLOT NO. 5, SHIRODA INDUSTRIAL ESTATE, SHIRODA GOA - 403103	922897176	-
9	The Supreme Industries Ltd.	Sudhir Kanvinde	Chief Information Officer (CIO)	1141, 1142 Solitaire Corporate park, Chakala, Andheri (East), Mumbai-400093	9167233494	kanvinde@supreme.co.in
10	BAPL ROTOTECH PVT LTD	Santosh Sharma	Sr. Vice President	Plot 186-B, Industrial Growth Centre, Sector 1Pithampur, Dhar, Madhya Pradesh-454775	8408886301	santosh.sharma@baplrototech.com
11	Infoway IT Solutions	Prakash Chandra Tiwari	Director	UD Complex, Miao Singpho Village, Miao and Distt: Changlang	8414859601	infowayitsolutionsmiao@gmail.com

				(A.P)		
12	Industrial Training Institute	Hassan Ansari	Principal	Jaynathpur (Near Hanuman Mandir) Lohardaga-835302 (Jharkhand)	9815107625	masaraswatipvtiti@gmail.com
13	M/S Placement cum Security Agency	Bamang Taniang	Proprietor	Near Tirap Festival Ground, Senki Park, Itanagar-791111, Arunachal Pradesh	9436050047	btaniang@gmail.com
14	Prasanthi Polytechnic	D Prasad	Principal	Duppituru (Vill), Aichutapuram (Md), Visakhapatnam (Dist), Andhra pradesh _ 531011	9849952573	Prasadreddy.1279@gmail.com
15	Predulive Innovations Pvt. Ltd	Shivanshu Dwivedi	Founder & MD	1596, Avas Vikas Colony Gandhinagar Basti, Uttar Pradesh – 272001	9918443373	shivanshu@predulivelabs.in
16	Surekha IT Services	Anjani K	Manager	8-3-191/84/302, Sharan Residency, Vengalrao Nagar, Hydrabad-500038, Telangana	8125134134	info@surekhaitservices.com
17	Tech Booster Education Private Limited	Monoj Dutta	Director	JONALI, ZOO ROAD, GUWAHATI, ASSAM	7002098953	monoj@techbooster.co.in

18	AISECT Ltd.	Teena Panthi	Assistant Manager	1-1-387, 3rd Floor, Flat no. 403/404, GNR Heights, Above SBI, Bakaram Road, Musheerabad, Hyderabad - 500020	7879982075	teena.panthi@aisect.org

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:

Refer NCVET "Guidelines for Blended Learning for Vocational Education, Training & Skilling" available on:

S. No.	Select the Components of the NOS	List Recommended Tools – for all Selected Components	Offline: Online Ratio
1	Theory/ Lectures - Imparting theoretical and conceptual knowledge	Online interaction platforms like Zoom, Google Meet	00:100
2	Imparting Soft Skills, Life Skills and Employability Skills /Mentorship to Learners	NA	NA

3	Showing Practical Demonstrations to the learners	Online interaction platforms like Zoom, Google Meet	00:100
4	Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	PCs/Laptops, Internet, Cloud based 3D Modeling software, slicing software, knowledge-base modules on 3D Printing & Product Design content, 3D Printer	50:50
5	Tutorials/ Assignments/ Drill/ Practice	Online interaction platforms like Zoom, Google Meet	00:100
6	Proctored Monitoring/ Assessment/ Evaluation/ Examinations	Examination	50:50
7	On the Job Training (OJT)/ Project Work Internship/ Candidate Training	Design, build and demonstrate a new 3D Printed product for any specific industry vertical based on given problem statement	100:00

Annexure VI: Standalone NOS- Performance Criteria details

1. Description

The standalone NOS equips students with design skills, problem-solving, and entrepreneurship skills. Students will gain practical insights into the transformative potential of additive manufacturing, mastering design, modeling, and printing techniques for creating diverse objects across various industries.

2. Scope

Students will learn about the impact of 3D printing across different sectors such as healthcare, aerospace, arts, architecture, and education. They will acquire practical skills in 3D printing technologies, including SLA/DLP, SLS, and FDM, and explore design concepts, slicing techniques, and post-processing methods. They will learn to use 3D modeling software to create 3D models for different industries and all about handling printers.

3. Elements and Performance Criteria:

Understanding 3D Printing Fundamentals:

PC1. Grasping the Impact:

Gain a comprehensive understanding of how 3D printing is revolutionizing traditional manufacturing processes. Recognize its profound effects on speeding up production, customizing products, and reducing costs across various industries.

PC2. Knowing Your Tech:

Develop familiarity with the diverse array of 3D printing technologies and materials available. Understand their respective strengths, applications, and limitations, particularly in sectors like healthcare and aerospace.

PC3. Getting the Design Right:

Acquire proficiency in applying fundamental design principles to ensure the accuracy and aesthetic appeal of 3D models. Master concepts such as geometric shapes, planes, edges, and vertices to create precise and visually appealing designs.

PC4. Designing Smart:

Learn to incorporate essential design considerations into your 3D modeling process. Understand factors like build volume, print orientation, bridging, support material, and overhangs to optimize the design for successful printing.

PC5. Slicing Like a Pro:

Develop expertise in slicing techniques to prepare 3D models for printing. Learn to adjust settings such as infill density, layer height, and support structures to achieve optimal print quality and reliability.

Practical 3D Modeling and Printing:

PC6. Mastering the Software:

Mastering the Software: Cultivate proficiency in using 3D modeling software to translate creative ideas into digital designs. Explore the full range of tools and features to manipulate shapes and structures with precision and efficiency.

PC7. Advanced Modeling Techniques:

Explore advanced modeling techniques to overcome challenges in creating complex geometries and intricate details. Develop innovative solutions to push the boundaries of what can be achieved through 3D printing.

PC8. Slicing Skills:

Hone your skills in slicing models for printing, optimizing parameters to achieve desired outcomes. Fine-tune settings such as infill density, layer height, and support structures to ensure successful printing and minimize material wastage.

PC9. Printing Like a Pro:

Gain practical experience in operating 3D printers effectively. Learn the nuances of printer setup, material handling, and troubleshooting techniques to address common issues and ensure smooth printing operations.

Knowledge Criteria (KCs):

KU1. Understanding the Big Picture: Develop a comprehensive understanding of the transformative impact of 3D printing on manufacturing processes. Appreciate its role in driving innovation, enhancing productivity, and reshaping industries.

KU2. Tech Know-How: Acquire knowledge about the diverse landscape of 3D printing technologies and materials. Understand their applications across different industries and the factors influencing material selection and printing methods.

KU3. Design Basics: Familiarize yourself with fundamental design principles to create functional and aesthetically pleasing 3D models. Understand geometric concepts and their application in designing for additive manufacturing.

KU4. Design Planning: Learn to anticipate and address challenges associated with the 3D printing process during the design phase. Consider factors such as print orientation, support structures, and material properties to optimize designs for successful printing.

KU5. Slicing Knowledge: Develop a deep understanding of slicing techniques and their impact on print quality and efficiency. Learn to tailor slicing parameters to achieve desired outcomes while minimizing print time and material usage.

Generic Skills (GS)

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

GS1. Problem-Solving: Develop problem-solving abilities by identifying and resolving challenges across design, printing, and post-processing phases. Learn to troubleshoot issues like design flaws, technical glitches, and material limitations while optimizing workflows for efficient and effective fabrication.

GS2. Technical Proficiency: Acquire in-depth understanding of 3D printer construction, various parts and sub-assemblies and their setting parameters. Learn to employ these settings for optimum printing process with respect to different parts and materials used to fabricate them.

GS3. Innovation: Nurture advanced creativity and strategic thinking to pioneer innovative solutions in 3D printing that tackle real-world problems. Learn to explore novel ideas, technologies, and methodologies to spark innovation and distinguish oneself in the field of additive manufacturing.

GS4. Project Management: Acquire project management competencies to oversee complex product development from inception to completion. Learn to employ skills in project planning, execution, risk management and resource allocation to achieve broader objectives.

GS5. Communication: Enhance communication skills to effectively convey complex technical concepts and project requirements to diverse stakeholders. Cultivate skills to be able to articulate ideas clearly, collaborate with cross-functional teams with diverse skill sets, and adapt communication styles suitable for different audiences and situations.

Annexure VII: Assessment Criteria

Detailed PC-wise assessment criteria and assessment marks for the NOS are as follows:

S. No.	Assessment Criteria for Performance Criteria	Theory Marks	Practical Marks	Project Marks	Viva Marks
3D Printing: Design and Development Fundamentals **Code: NIE/ELE/N2401**	**Understanding 3D Printing Fundamentals:** PC1. Grasping the Impact: Gain a comprehensive understanding of how 3D printing is revolutionizing traditional manufacturing processes. Recognize its profound effects on speeding up production, customizing products, and reducing costs across	50	30	10	10

	various industries. PC2. Knowing Your Tech: Develop familiarity with the diverse array of 3D printing technologies and materials available. Understand their respective strengths, applications, and limitations, particularly in sectors like healthcare and aerospace. PC3. Getting the Design Right: Acquire proficiency in applying fundamental design principles to ensure the accuracy and aesthetic appeal of 3D models. Master concepts such as geometric shapes, planes, edges, and vertices to create precise and visually appealing designs. PC4. Designing Smart: Learn to incorporate essential design considerations into your 3D modeling process. Understand factors like build volume, print orientation, bridging, support material, and overhangs to optimize the design for successful printing. PC5. Slicing Like a Pro: Develop expertise in slicing techniques to prepare 3D models for printing. Learn to adjust settings such as infill density, layer height, and support structures to achieve optimal print quality and reliability.				
	3D Modeling and Printing PC6. Mastering the Software: Cultivate proficiency in using 3D modeling software to translate creative ideas into digital designs. Explore the full range of tools and features to manipulate shapes and structures with precision and efficiency.	50	30	10	10

	PC7. Advanced Modeling Techniques: Explore advanced modeling techniques to overcome challenges in creating complex geometries and intricate details. Develop innovative solutions to push the boundaries of what can be achieved through 3D printing. PC8. Slicing Skills: Hone your skills in slicing models for printing, optimizing parameters to achieve desired outcomes. Fine-tune settings such as infill density, layer height, and support structures to ensure successful printing and minimize material wastage. PC9. Printing Like a Pro: Gain practical experience in operating 3D printers effectively. Learn the nuances of printer setup, material handling, and troubleshooting techniques to address common issues and ensure smooth printing operations.				
Total Marks: 200		**100**	**60**	**20**	**20**

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 and Practical examinations.

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 the roll number.
3. The assessor carries out theory assessments. Theory examination would be conducted online, and the paper comprise of MCQ.
4. The assessor carries out practical assessments. Practical examination would be conducted 100% offline creating own 3D Printed solutions and successful demonstration of the same.
5. Pass percentage would be 50% marks.
6. 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.