QUALIFICATION FILE

3D Printing Modelling Engineer

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

☒ Upskilling ☐ Dual/Flexi Qualification ☐ For ToT

☐ For ToA

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

NCrF/NSQF Level: 5

Submitted By

IT-ITeS Sector Skills Council NASSCOM (SSC NASSCOM)
Plot No. – 7, 8, 9 & 10
Sector – 126, Noida, Uttar Pradesh - 201303

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Section 1: Basic Details

1.	**Qualification Name**	**3D Printing Modelling Engineer**	
2.	**Sector/s**	**IT/ITeS**	
3.	**Type of Qualification:** ☐ **New** ☒ **Revised** ☐ **Has Electives/Options** ☐ **OEM**	**NQR Code & version of the existing /previous qualification: QG-05-IT-01509-2023-V1.1-NASSCOM & Version 2**	**Qualification Name of the existing/previous version:** 3D Printing Modelling Engineer
4.	**a. OEM Name** **b. Qualification Name** *(Wherever applicable)*		
5.	**National Qualification Register (NQR) Code &Version** (*Will be issued after NSQC approval*)	QG-05-IT-01509-2025-V2-NASSCOM & Version 3	**6. NCrF/NSQF Level:** 5
7.	**Award (Certificate/Diploma/Advance Diploma/ Any Other** *(Wherever applicable specify multiple entry/exits also & provide details in annexure)*	Certificate	
8.	**Brief Description of the Qualification**	Individuals at this job are responsible for creating design, conceptualization, development of 3d models in the design software programs and generation of the G-codes for printing the product	
9.	**Eligibility Criteria for Entry for a Student/Trainee/Learner/Employee**	**Entry Qualification & Relevant Experience:** *Relevant experience in job roles related to 3D Printing/ Additive Manufacturing The relevant experience would include work, internship and apprenticeship undertaken post completion of relevant educational qualification. ** UG/PG/degree/diploma with courses related to Engg./ Science	

S. No.	Academic/Skill Qualification (with Specialization - if applicable)	Required Experience (with Specialization - if applicable)

1	Completed UG Diploma** or equivalent	-
2	Completed 3-Year Diploma** after 10th	1.5 Year of relevant experience*
3	Previous Relevant qualification of NSQF level 4.5	1.5 years of relevant experience*

Min Age: NA

10.	**Credits Assigned to this Qualification, Subject to Assessment** *(as per National Credit Framework (NCrF))*	16 Credits	**11. Common Cost Norm Category (I/II/III)** *(wherever applicable)*: **II**
12.	**Any Licensing Requirements for Undertaking Training on This Qualification** *(wherever applicable)*	NA	
13.	**Training Duration by Modes of Training Delivery** *(Specify **Total Duration** as per selected training delivery modes and as per requirement of the qualification)*	☐**Offline** ☐**Online** ☒**Blended**	
14.	**Aligned to NCO/ISCO Code/s** *(if no code is available mention the same)*	NCO-2015/2513	
15.	**Progression Path After Attaining the Qualification, wherever applicable** *(Please show Professional and Academic progression)*	This entry should refer to one or more of the following: Lead Application Developer	
16.	**Other Indian languages in which the Qualification & Model Curriculum are being submitted**	Hindi	

Training Delivery Mode	Theory (Hours)	Practical (Hours)	OJT (Mandatory) Hours	OJT (Recommended) Hours	Total (Hours)
Classroom (offline)	149	241	90	-	480
Online	149	241	90	-	

(Refer Blended Learning Annexure for details)

17.	**Is similar Qualification(s) available on NQR-if yes, justification for this qualification**	**☐ Yes ☒ No URLs of similar Qualifications:**	
18.	**Is the Job Amenable to Persons with Disability**	**☒ Yes ☐ No** **If "Yes", specify applicable type of Disability:** Visual, Hearing or Speech impairment, Locomotor Disability	
19.	**How will participation of women be encouraged?**	The Program is gender neutral although to increase women's participation, organizations are keeping aside a few seats to encourage female candidates.	
20.	**Are Greening/Environment Sustainability Aspects covered** (*Specify the NOS/Module which Covers it)*	**☒ Yes ☐ No DGT/VSQ/N0102: Employability Skills (60 Hours)**	
21.	**Is Qualification suitable to be offered in Schools/Colleges**	**Schools: ☐ Yes ☒ No Colleges ☒ Yes ☐ No**	
22.	**Name and Contact Details Submitting / Awarding Body SPOC** *(In case of CS or MS, provide details of both Lead AB & Supporting ABs)*	**Name: Namrata Kapur** **Email: Standards@nasscom.in** **Contact No.: 0120-4990111** **Website: https://www.sscnasscom.com/**	
23.	**Final Approval Date by NSQC: 07/10/2025**	**24. Validity Duration:** 3 Years	**25. Next Review Date: 07/10/2028**

Section 2: Module Summary

NOS/s of Qualifications

(In exceptional cases these could be described as components)

Mandatory NOS/s:

Specify the training duration and assessment criteria at NOS/Module level. For Further details refer curriculum document.

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

S.No.	NOS/Module Name	NOS/Module Code & Version (If Applicable)	Core/Non-Core	NCrF/NSQF Level	Credits as per NcRF	Training Duration (Hours)					Assessment Marks					
						Th.	Pr.	OJT-Man.	OJT-Rec.	Total	Th.	Pr.	Proj.	Viva	Total	Weightage (%) (if applicable)
1.	Design and develop finalized 3D models and product prototypes using CAD/CAM programs	SSC/N8912 V3.0	Core	5	04	30:00	60:00	30:00	00:00	120:00	30	50	-	20	100	30
2.	Structure and conduct appropriate simulation tests, design optimization techniques to validate and finalize the 3D CAD models.	SSC/N8913 V3.0	Core	5	05	45:00	75:00	30:00	00:00	150:00	30	50	-	20	100	30
3.	Export print-ready digital design files and generate tools paths for 3D printers in the form of G-code instructions	SSC/N8914 V3.0	Core	5	05	50:00	70:00	30:00	00:00	150:00	30	50	-	20	100	30
4.	Employability Skills (60 hours)	DGT/VSQ/N0102 V1.0	Non-Core	4	02	24:00	36:00	00:00	00:00	60:00	20	30	-	-	50	10

S.No.	NOS/Module Name	NOS/Module Code & Version (If Applicable)	Core/Non-Core	NCrF/NSQF Level	Credits as per NcRF	Training Duration (Hours)					Assessment Marks					
						Th.	Pr.	OJT-Man.	OJT-Rec.	Total	Th.	Pr.	Proj.	Viva	Total	Weightage (%) (if applicable)
Grand Total					16	149:00	241:00	90:00	00:00	480:00	110	180	-	60	350	100

Elective NOS/s:

S. No	NOS/Module Name	NOS/Module Code & Version *(if applicable)*	Core/ Non-Core	NCrF/NSQF Level	Credits as per NCrF	Training Duration (Hours)					Assessment Marks					
						Th.	Pr.	OJT-Man.	OJT-Rec.	Total	Th.	Pr.	Proj.	Viva	Total	Weightage (%) *(if applicable)*
1.																
2.																
Duration (in Hours) / Total Marks																

Optional NOS/s:

S. No	NOS/Module Name	NOS/Module Code & Version *(if applicable)*	Core/ Non-Core	NCrF/NSQF Level	Credits as per NCrF	Training Duration (Hours)					Assessment Marks					
						Th.	Pr.	OJT-Man.	OJT-Rec.	Total	Th.	Pr.	Proj.	Viva	Total	Weightage (%) *(if applicable)*
1.																
2.																
Duration (in Hours) / Total Marks																

Assessment - Minimum Qualifying Percentage

Assessment - Minimum Qualifying Percentage

Minimum Pass Percentage – Aggregate at qualification level: 70 % (Every Trainee should score specified minimum aggregate passing percentage at qualification level to successfully clear the assessment.)

Section 3: Training Related

1.	**Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	**Educational Qualification:** Graduate (Engineering/ Technology/ Computer Science) **Industry & training experience:** 2 years of industry experience in 3D printing. The industry experience would include work, internship, and apprenticeships undertaken after regular graduation. **Certification:** "Trainer" mapped to the Qualification Pack "MEP/Q2601" Minimum accepted score is 80% aggregate
2.	**Master Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	**Educational Qualification:** Graduate (Engineering/ Technology/ Computer Science) **Industry & training experience:** 4 years of industry experience in 3D printing. The full-time experience would include work, internship, and apprenticeships undertaken after regular graduation. **Certification:** "Master Trainer" mapped to the Qualification Pack "MEP/Q2602" Minimum accepted score is 90% aggregate
3.	**Tools and Equipment Required for the Training**	☒Yes ☐No *(If "Yes", details to be provided in Annexure)*
4.	**In Case of Revised Qualification, details of Any Upskilling Required for Trainer**	NA

Section 4: Assessment Related

1.	**Assessor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	**Educational Qualification:** Graduate (Engineering/ Technology/ Computer Science) **Industry & Training Experience:** 2 years of industry experience in 3D printing. The full-time experience would include work, internship, and apprenticeship undertaken after regular graduation. **Certification:** "Assessor" mapped to the Qualification Pack "MEP/Q2701" Minimum accepted score is 80% aggregate.
2.	**Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines), (wherever applicable)*	**Educational Qualification:** Graduate (Engineering/ Technology/ Computer Science) **Industry & Training Experience:** 2 years of industry experience in 3D printing. The full-time experience would include work, internship, and apprenticeship undertaken after regular graduation. **Certification:** "Assessor" mapped to the Qualification Pack "MEP/Q2701" Minimum accepted score is 80% aggregate.
3.	**Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	**Educational Qualification:** Graduate (Engineering/ Technology/ Computer Science) **Industry & Training Experience:** 4 years of industry experience in 3D printing. The full-time experience would include work, internship, and apprenticeship undertaken after regular graduation. **Certification:** "Lead Assessor" mapped to the Qualification Pack "MEP/Q2702" Minimum accepted score is 90% aggregate.
4.	**Assessment Mode** *(Specify the assessment mode)*	The assessment will consist of a blend of hands-on practical evaluations, viva-voce, and online proctored scenario-based multiple-choice questions ensuring a thorough evaluation of the individual's proficiency in learning outcomes, practical understanding, and real-world application of concepts.
5.	**Tools and Equipment Required for Assessment**	☒ Same as for training ☐ Yes ☐ No *(details to be provided in Annexure-if it is different for Assessment)*

Section 5: Evidence of the Need for the Qualification

Provide Annexure/Supporting documents name.

1.	Latest Skill Gap study (not older than 2 years) (Yes/No): NA
2.	Latest Market Research Reports or any other source (not older than 2 years) (Yes/No): NA

3.	Government/Industry initiatives/requirement (Yes/No): NA
4.	Number of industry validations provided: 15
5.	Estimated number of people to be trained and employed: 500
6.	Evidence of Concurrence/Consultation with Line/State Departments: NA If "No", why:

Section 6: Annexure & Supporting Documents Check List

Specify Annexure Name / Supporting document file name

1.	**Annexure:** NCrF/NSQF level justification based on NCrF/NSQF descriptors *(Mandatory)*	Evidence of Level
2.	**Annexure:** List of tools and equipment relevant for NOS *(Mandatory, except in case of online course)*	Tools and Equipment (lab set-up)
3.	**Annexure:** Detailed Assessment criteria *(Mandatory)*	Performance Criteria Details
4.	**Annexure:** Assessment Strategy *(Mandatory)*	Assessment Strategy
5.	**Annexure:** Blended Learning *(Mandatory, in case selected Mode of delivery is Blended Learning)*	NA
6.	**Annexure:** Multiple Entry Exit Details *(Mandatory, in case qualification has multiple entry-exit)*	NA
7.	**Annexure:** Acronym and Glossary *(Optional)*	NA
8.	**Supporting Document:** Model Curriculum *(Mandatory-Public View)*	MC_SSC/Q8903_3D Printing Modelling Engineer_V3.0
9.	**Supporting Document:** Career Progression *(Mandatory-Public View)*	3D Printing Occupational Map
10.	**Supporting Document:** Occupational Map *(Mandatory)*	3D Printing Occupational Map
11.	**Supporting Document:** Assessment SOP *(Mandatory)*	Assessment Strategy
12.	**Any Other document you wish to submit:**	NA

Annexure: 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
Process	• Assess the product requirement and develop the concept with the application of sketch and representation in 2D • Understand Dfam principle for topology optimization • Understand the G-code generation and printing process.	The individual in this role must work in a constantly changing environment where he/she needs to develop different product designs and variations He/she also needs to be able to own the workflows and finish the tasks within the deadline. He/she must interact with stakeholders across various functions for the benefit of the organization	5
Professional knowledge	• Organizational policies, procedures, and priorities for identifying exceptions, handling them and accessing knowledgebase to update information on exception handling • Understanding of keywords (Dfam, TO, FDM etc.) related to the 3d printing process • Aware of new updates/initiatives/changes in the field of 3d printing	The individual in this role must have a knowledge of the tools, software and printer required in the process based on the application. He should be able to conduct the simulation tests and understand the design optimization techniques	5
Professional skill	• Understanding of different tools required for high-level product design & development • Understand different 3d printing techniques such as FDM, SLS,SLA etc. and their practical applications	The role demands a creative skillset that allows the individual to develop the product design while fulfilling the business considerations of the customer	5

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
	• Understand different modeling tools based on application and product features		
Core skill	Understanding of different software required • 3D modeling Software: • 3D simulation software • Design Optimization software • Slicing Software	The individual must apply his/her skill in using various tools related to CAD design software, design optimization and simulation and generation of G-Codes	5
Responsibility	• Development of knowledge, skills, and competences • Build and maintain relationships with colleagues and other teams • Ensure that the work meets the required quality and timelines • Manage and collaborate with stakeholders for project succes	The role demands working in a team to develop 3d printed designs and products. The Individual might often be required to apply balanced judgments or take advice from senior team members/stakeholders to address different situation	5

Annexure: Tools and Equipment (lab set-up)

Batch Size:

S. No.	Tool / Equipment Name	Specification	Quantity for specified Batch size
1	PC/Laptop with internet	-	
2	Microphone/Voice System	For lecture & class activities	
3	White Board with marker	-	
4	Projector	-	
5	Finite Element Analysis and Simulation-Analysis software	CalculiX, OpenFOAM	
6	Topology optimization software	OpenVSP	
7	CAD Software	FreeCAD	
8	Slicing software	Cura	
9	Mesh Repair Software	Netfabb (Free tier)	
10	G-code Viewer	Gcode Analyzer (Free tiers)	
11	Data Analysis and Visualization	R,Python with Matplotlib/Seaborn	

12	Generative Design and AI tool	Blender	
13	Project Management and Collaboration tool	Projectlibre	
14	Material Properties Database	Matweb	
15	3D Printer	-	
16	Measuring tools for evaluating printed models	Vernier Calipar, Scale	

*Tools are open source

Annexure: Industry Validations Summary

S. No	Organization Name	Representative Name	Designation	Contact address	Contact Phone No	E-mail ID	LinkedIn profile (if available)
1	Lam research	Amit Powar	Program Lead Engineer	-	9665577060	amit.powar@lamresearch.com	https://www.linkedin.com/in/amit-powar-09a6b66a/
2	Raja Ramanna Centre for Advanced Technology (RRCAT)	Dr Christ Paul Prakash	Head of AM Research at Raja Ramanna Centre for Advanced Technology, Indore	-	9425666596/7415666596	paulcp@rrcat.gov.in & drcppaul2019@gmail.com	https://www.linkedin.com/in/christ-p-paul/
3	Atal tinkering labs	Avikshit Saras	ATL mentor	-	9810163654	Hi@delhi3dprinting.com	https://www.linkedin.com/in/avikshit-a-saras-msc-coo-748721a/
4	Divide by Zero	Swapnil Sansare	CEO & Founder	-	9833828199	swapnil@divbyz.com	-
5	IBM	Arpita Majumder	Tech Consultant	-	7894369677	Arpita.majumder@ibm.com	https://www.linkedin.com/in/arpita-majumder-85612a67/

6	Intellibren	Kailash PD	Director, Technology	-	6374700185	kailash@intellibren.com	-
7	Mindshare (Inclusive Minds)	Pamindar Singh	Team Lead	-	8713901984	paminder.singh@themindshare.in	https://www.linkedin.com/in/paminder-singh-7990b8101/
8	S3V Vascular Technologies	Yeaswanth Raj V	Clinical Research Executive	-	7502629955	yeaswanthraj@gmail.com	-
9	Forbes Advisor	Naveenkumar Janakiraman	Data Research Analyst	-	9976773109	naveenkumarj4997@gmail.com	https://www.linkedin.com/in/naveenkumar-janakiraman
10	Kornferry	Ragul Kumar	Data analyst	-	9659964881	ragul@kornferry.com	https://www.linkedin.com/in/ragul-kumar-b2297a171/
11	TCS	Sree Karthikeyan	Cybersecurity IAM Analyst	-	9626165768	sreekarthikeyan0898@gmail.com	-
12	Wipro	Narendra Nande	Practice Director (VLSI SW and PSV Practice)	-	9900086708	narendra.nande@wipro.com	https://www.linkedin.com/in/narendra-nande-84402a2/
13	Q Acadmey	Deepak Gour	Product and Academic Head	-	9893554394	deepak@qacademy.ca	https://ca.linkedin.com/in/deepak-gour-8853968
14	Volkswagen	Ranjithkumar. K	Test Analyst		8838107162	ranjikadri@gmail.com	
15	Freenlance Consultant-SME	Vaman Kulkarni	AM consultant and Ex Honeywell AM Head (retired)	-	9449039761 /9900079244	vamankuls@gmail.com	https://www.linkedin.com/in/vaman-kulkarni-13535715/

Provide summary information of all the industry validation in table.

Sl. No.	Organization	Representative Name	Designation	Contact Address	Contact Number	Email ID	LinkedIn profile (If available)

Annexure: Training & Employment Details

Training & Employment Projections:

Year	Total Candidates		Women		People with Disability	
	Estimated Training #	Estimated Employed Opportunities	Estimated Training #	Estimated Employed Opportunities	Estimated Training #	Estimated Employed Opportunities
2023-24	100	90	20	18	10	6
2024-25	200	180	40	36	20	12
2025-26	200	180	40	36	20	12

#The Estimated Data is an average for each state.

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

Qualification Version	Year	Total Candidates			Women			People with disability		
		Trained	Assessed	Certified	Trained	Assessed	Certified	Trained	Assessed	Certified
		-	-	-	-	-	-	-	-	-

Content availability for the previous version of qualifications:

☐ Participant Handbook ☐ Facilitator Guide ☐ Digital Content ☐ Qualification Handbook ☐ Any Other:

Language in which content is available:

Annexure: Blended Learning

Refer NCVET "Guidelines for Blended Learning for Vocational Education, Training & Skilling" available on:
https://ncvet.gov.in/sites/default/files/Guidelines%20for%20Blended%20Learning%20for%20Vocational%20Education,%20Training%20&%20Skilling.pdf

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	NA	NA
2	☐Imparting Soft Skills, Life Skills, and Employability Skills /Mentorship to Learners	NA	NA
3	☐Showing Practical Demonstrations to the learners	NA	NA
4	☐Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	NA	NA
5	☐Tutorials/ Assignments/ Drill/ Practice	NA	NA
6	☐Proctored Monitoring/ Assessment/ Evaluation/ Examinations	NA	NA
7	☐On the Job Training (OJT)/ Project Work Internship/ Apprenticeship Training	NA	NA

Annexure: Detailed Assessment Criteria

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

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
SSC/N8912 Design and develop finalised 3D models and product prototypes using CAD/CAM programs	PC.1 Incorporate DfAM (Design for Additive Manufacturing) principles to optimize the design methodology based on 3D printing technology.	0.5	1	-	0.5
	PC.2 Evaluate part consolidation, geometric freedom, and biomimicry to enhance design capabilities.	0.5	1	-	0.5
	PC.3 Consider key process-specific, material-driven design guidelines, rules, and considerations.	0.5	1	-	0.5
	PC.4 Consider limitations of 3D printing parts, pre-defined design allowables in line with industry standards to comprehend design feasibility.	0.5	1	-	0.5
	PC.5 Include suggested material types, colors, infill levels, orientations, and finishing methods in the 3D design.	0.5	1	-	0.5
	PC.6 Evaluate the constraints in physical properties of materials, including supports for overhangs, walls, and corners.	0.5	1	-	0.5

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
	PC.7 Determine shapes of components with fewer stress points, smaller footprints, and superior mechanical properties.	1	1.5	-	0.5
	PC.8 Decide on the minimum level of detail required based on the specific 3D printing technology.	1	1.5	-	0.5
	PC.9 Quantify and prioritize necessary mechanical properties, standards, and loads for the parts.	1	1.5	-	0.5
	PC.10 Refer to industry standards for applicable mechanical properties, including tensile, compression, flexural strength, and wear resistance.	1	1.5	-	0.5
	PC.11 Analyze loading conditions to design parts such that largest forces traverse planes parallel to the print bed for optimal strength.	1	1.5	-	0.5
	PC.12 Identify critical dimensions and features, including minimum wall thickness and support variables, adjusting for printer precision.	1	1.5	-	0.5
	PC.13 Maximize print bed contact to minimize the need for supports and improve bed adhesion.	1	1.5	-	0.5
	PC.14 Orient the part optimally so the largest face lies on the print bed unless dictated otherwise by strength or geometry.	1	1.5	-	0.5
	PC.15 Reduce supports and improve overhangs by optimizing angles to decrease printing and processing time.	1	1.5	-	0.5
	PC.16 Avoid large flat surfaces and use rounded corners to prevent warping during printing.	1	1.5	-	0.5
	PC.17 Use fillets or chamfer edges to ensure smooth transitions and reduce stress concentrations.	1	1.5	-	0.5
	PC.18 Thicken vulnerable areas and appendages from the core to prevent breakage.	1	1.5	-	0.5
	PC.19 Conduct operations between software systems to enhance workflows and design capabilities.	1	1.5	-	0.5
	PC.20 Compare CAD modeling software solutions to identify the most suitable package for 3D printing technology.	1	1.5	-	0.5
	PC.21 Incorporate AI-driven generative design methodologies and software tools for innovative solutions.	1	1.5	-	0.5
	PC.22 Set part parameters like mount points and environmental stresses without strictly dictating the shape of the object.	1	1.5	-	0.5
	PC.23 Extract and modify geometries generated by AI-based algorithms in CAD systems.	1	1.5	-	0.5
	PC.24 Design and create special effects, including particle effects and dynamic simulations.	1	1.5	-	0.5
	PC.25 Utilize software solutions to automate design workflows through scripting.	1	1.5	-	0.5

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
	PC.26 Define target user needs and product requirements to ensure alignment with market expectations.	1	1.5	-	0.5
	PC.27 Analyze product lifecycle and sustainability, considering recyclability and environmental impact.	1	2	-	1
	PC.28 Use feedback from prototype testing and user trials to iteratively improve product design.	1	2	-	1
	PC.29 Establish quality assurance protocols for testing prototypes to ensure functionality and compliance.	1	2	-	1
	PC.30 Ensure alignment with branding and aesthetic considerations to create products that resonate with target audiences.	1	2	-	1
	PC.31 Establish quality assurance protocols for testing prototypes to ensure functionality and compliance with specifications.	1	2	-	1
	PC.32 Ensure alignment with industry standards for applicable mechanical properties.	1	2	-	1
	PC.33 Plan for manufacturability (DfM) by considering cost-effectiveness during production.	1	2	-	1
	Total Marks	**30**	**50**	**-**	**20**
SSC/N8913: Structure and conduct appropriate simulation tests, design optimization techniques to validate and finalise the 3D CAD models	PC.1 Perform multiple simulation runs to ensure the design is compatible with the chosen manufacturing processes.	1	1	-	0.5
	PC.2 Aim to enhance the maximum pre-print accuracy of the CAD models by creating various test scenarios in iterations.	1	1	-	0.5
	PC.3 Start with simple models and gradually modify them as the simulations present plausible results.	1	1	-	0.5
	PC.4 Create a detailed project plan to accommodate multiple iterations of FEA and TO (Topology Optimization) simulations coherently.	1	1	-	0.5
	PC.5 Establish a clear set of success criteria for simulations based on project goals and performance targets to ensure results align with intended outcomes.	1	1	-	0.5
	PC.6 Conduct Finite Element Analysis (FEA) to understand and quantify the effects of real-world conditions on a part or assembly.	1	1	-	0.5
	PC.7 Research and select from the most advanced FEA simulation software packages best suited for the analysis requirements.	1	1	-	0.5
	PC.8 Determine and prioritize various types of FEA simulations like structural, thermal, computational fluid dynamics (CFD), etc., based on the process, materials, and necessary performance indicators.	1	1	-	0.5
	PC.9 Generate a mesh model and refine the mesh using an iterative process of the FEA theory.	1	1	-	0.5

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
	PC.10 Define element type, choose material data set, and assign all the properties required.	1	1	-	0.5
	PC.11 Enter sections and assign all the loads, constants, and boundary conditions according to the type of simulation.	1	2	-	0.5
	PC.12 Request the data output according to the variables you want to study, i.e., forces, displacements, stresses, strengths, etc.	1	2	-	0.5
	PC.13 Analyze the data by plotting contours of the requested variables, evaluating the deformed and undeformed shapes plots in the form of custom tabular reports.	1	2	-	0.5
	PC.14 Obtain a detailed visualization of where structures bend or twist, and the distribution of stresses and displacements as results.	1	2	-	0.5
	PC.15 Utilize sensitivity analysis to understand how variations in input parameters affect simulation outcomes.	1	2	-	0.5
	PC.16 Verify if the upper limits of failure meet the required mechanical properties, standards, and loads as anticipated.	1	2	-	0.5
	PC.17 Consider redesigning the models based on the results for further analysis.	1	2	-	0.5
	PC.18 Incorporate advanced simulation techniques such as multi-physics simulations that combine thermal, structural, and fluid dynamics analyses when necessary.	1	2	-	0.5
	PC.19 Validate simulation results with physical testing of prototypes to verify accuracy and refine models based on observed discrepancies.	1	2	-	0.5
	PC.20 Perform Topology Optimization (TO) after the initial FEA simulation results check out for optimal material distribution layout.	1	2	-	0.5
	PC.21 Select from the available list of specific TO software solutions or the usual CAD packages.	1	2	-	1
	PC.22 Conduct topology optimization using the Finite Element Method (FEM).	1	2	-	1
	PC.23 Aim to optimize material layout within a predefined set of loads, conditions, and constraints.	1	2	-	1
	PC.24 Maximize the performance and efficiency of design by removing redundant material from areas that do not need to carry significant loads.	1	2	-	1
	PC.25 Solve design challenges like reducing unnecessary weight, resonance, and thermal stresses (e.g., lattice structures).	1	2	-	1
	PC.26 Determine the minimum allowable design space necessary for shape optimization of the product.	1	2	-	1
	PC.27 Use TO software to test the structural integrity and identify unnecessary material under various simulated stress scenarios.	1	2	-	1

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
	PC.28 Implement the design modifications continuously as indicated by the simulation test outcomes.	1	2	-	1
	PC.29 Analyze cost implications associated with different design optimizations to ensure that performance improvements do not significantly increase production costs.	1	2	-	1
	PC.30 Train and mentor team members on best practices in simulation methods and software usage to enhance overall team capabilities.	1	2	-	1
	Total Marks	**30**	**50**	**-**	**20**
SSC/N8914:Export print-ready digital design files and generate tools paths for 3D printers in the form of G-code instructions	PC.1 Transform the raw design files and renders into 3D printable digital file formats as Polygon Mesh models.	1	2	-	0.5
	PC.2 Select from different file formats to export like STL, STEP, IGES or IGS, OBJ, 3MF, or DXF, with STL being the most commonly preferred format.	1	2	-	0.5
	PC.3 Employ appropriate methods to export based on the CAD program being used.	1	2	-	0.5
	PC.4 Consider the parameters used for outputting an STL file and their effect on the faceting of the mesh model.	1	2	-	0.5
	PC.5 Understand that smoother/less faceted surfaces (higher poly count or triangulation) result in larger STL file sizes.	1	2	-	0.5
	PC.6 Determine factors like chordal tolerance or deviation, angle control, and minimum triangle side length.	1	2	-	0.5
	PC.7 Strike a balance between the model, desired surface fidelity, and the 3D printing process of choice, as 3D printing can only accept a certain size.	1	2	-	0.5
	PC.8 Adjust the values of the chordal and angular tolerance to generate the optimal file size and mesh faceting without compromising on resolution.	1	2	-	0.5
	PC.9 After generating the mesh, ensure supports are created for the mesh model intelligently.	1	2	-	1
	PC.10 Use mesh repair tools to check, repair, and optimize the mesh before slicing	1	2	-	1
	PC.11 Process the STL file using a slicer or slicing software to generate automated tool paths.	1	2	-	1
	PC.12 Convert the model into a series of thin layers through the slicer, producing a G-code file (.gcode) containing instructions tailored to a specific type of 3D printer.	1	2	-	1
	PC.13 Determine optimal printing build parameters in the slicing software with regard to necessary mechanical properties, standards, and load requirements.	1	2	-	1
	PC.14 Input parameters like orientation, fill pattern, layer thickness, print speed, temperature, and other printer-specific settings.	1	2	-	1
	PC.15 If needed, modify model specifications partially through scaling features in the slicer before processing.	1	2	-	1

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
	PC.16 Select the right slicing software based on organizational preferences, as the choice of slicer will impact the final print quality.	1	2	-	1
	PC.17 Utilize advanced slicing features such as adaptive layer height for optimized print quality and reduced print time.	1	2		1
	PC.18 Implement support structures intelligently, considering their impact on ease of removal and print quality.	1	2		1
	PC.19 Conduct print simulations within the slicer to visualize potential issues and optimally adjust settings.	2	2		1
	PC.20 Export G-code from slicing software and import the G-code file into the 3D printing software.	2	2		1
	PC.21 Familiarize yourself with printer-specific G-code commands and syntax for manual adjustments if necessary.	2	2		1
	PC.22 Analyze material flow and deposition in the slicer to ensure effective printing of complex geometries.	2	2		1
	PC.23 Maintain a library of optimized profiles for different materials and settings for consistency in print quality.	2	3		1
	PC.24 Conduct test prints with different settings to identify the best configurations for particular geometries or materials.	2	3		1
	Total Marks	**30**	**50**	**-**	**20**
DGT/VSQ/ N0102 Employability Skills (60 Hrs)	PC.1 Introduction to Employability Skills	1	1	-	-
	PC.2 Constitutional values – Citizenship	1	1	-	-
	PC.3 Becoming a Professional in the 21st Century	2	4	-	-
	PC.4 Basic English Skills	2	3	-	-
	PC.5 Career Development & Goal Setting	1	2	-	-
	PC.6 Communication Skills	2	2	-	-
	PC.7 Diversity & Inclusion	1	2	-	-
	PC.8 Financial and Legal Literacy	2	3	-	-
	PC.9 Essential Digital Skills	3	4	-	-
	PC.10 Entrepreneurship	2	3	-	-
	PC.11 Customer Service	1	2	-	-
	PC.12 Getting Ready for Apprenticeship & Jobs	2	3	-	-
	Total Marks	**20**	**30**	**-**	**-**

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Grand Total Marks		**110**	**180**	**-**	**60**

Annexure: Assessment Strategy

Assessment Process Overview

Batch Creation & Assessment Request:

Training Providers (TP) or Training Centers (TC), including any other authorized partner of Ministry/ Department create batches / push batches on the SIDH portal. Assessment requests are submitted through the SIDH portal or via email or other media as authorized from time to time. For NON-SIDH schemes, assessment requests are received electronically or through respective State Skill Mission portals. TP/TC initiates the assessment request through the InSDMS portal and processes the payment (where applicable).

Batch Alignment & Confirmation:

Upon payment confirmation, batches are assigned to the Assessment Agency based on factors like:

- Assessment readiness
- Availability of certified assessors for the specific job role
- Assessment capping to an assessment agency as prescribed from time to time for an AB An email communication / prescribed mode communication is sent to TP/TC for confirmation of the assessment date, with IT-ITeS SSC in the loop. Once confirmation is received, the Assessment Agency designates a TOA-certified assessor to conduct or facilitate the assessment.
- Batches are only formed when the Qualification is active.

Candidate Verification & Assessment Execution:

Candidate details are verified and documented at the beginning of the assessment by a certified assessor. A Quality Assurance (QA) mechanism is enforced, requiring an undertaking from the TC. Regular feedback is collected from TP/TC to ensure continuous improvement.

Evidence Collection & Validation:

Proctors or assessors capture date/time-stamped and geo-tagged photographs of the assessment location during the process. Attendance is also ensured offline. A PC-wise result analysis is conducted to refine assessment standards.

Monitoring & Compliance:

Batch monitoring follows established protocols, ensuring adherence to assessment guidelines. Sample based surprise visits are conducted at TC locations during both training and assessments to verify compliance. This structured approach ensures transparency, quality control, and validation throughout the assessment process.

Testing Environment:

- Check the Assessment location, date and time
- If the batch size is more than 30, then there should be 2 Assessors.
- Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.

Assessment Quality Assurance levels/Framework:

IT-ITeS SSC nasscom is responsible for the development and periodic review of the question bank developed for a specific job role. We publish an openly accessible sample /model question paper on our website for all stakeholders. The quality of the Question Bank created by the assessment designer is validated by a Subject matter experts on the following parameters:

- Appropriateness of the Question Bank in terms of facts, data and information.
- Checks for grammar, spellings, scripting and formatting.
- The information provided should be specific enough to remove any ambiguity in answers/solutions to the question.
- Relevance – Assessing the topic well w.r.t. the job role.
- Check if the difficulty level of each question is as per the matrix.
- Check if the images used in the question are clear and relevant.
- All variables, symbols and abbreviations used must be declared.
- The correct answer option should be unique, and the options should not be overlapping

Annexure: 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
OJT	On Job Training

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 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 about 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 based on their main economic function, product, service, or technology.

Annexure: Market Research & Gap Analysis

To cater to next-generation digital manufacturing and mitigate immediate disabilities of local industries, the Government of India released a "National Strategy on Additive Manufacturing (AM)" or 3D printing that aims to add $2-3 billion to the GDP by 2025. Under this, the government plans to create 50 India-specific technologies for material, machine, process, and software to make India a 3D-printed design and manufacturing hub. This will create an ecosystem for creating nearly 100 new start-ups, ten existing and new manufacturing sectors, and one-lakh new skilled manpower besides developing 500 AM products and 50 Indian AM technologies on material, machine, process, and software. In addition, awareness for the adoption of AM products to facilitate this growth will be created.

https://www.meity.gov.in/content/national-strategy-additive-manufacturing