QUALIFICATION FILE-Standalone NOS

Essentials of New Product Introduction (NPI) in Semiconductor Manufacturing

☐ Horizontal/Generic ☐ Vertical/Specialization

☐ Upskilling ☐ Dual/Flexi Qualification ☐ For ToT ☐ For ToA

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

NCrF/NSQF Level: 4.5

Submitted By:

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Section 1: Basic Details

<table>
<tr><td>1.</td><td>NOS-Qualification Name</td><td colspan="2">Essentials of New Product Introduction (NPI) in Semiconductor Manufacturing</td></tr>
<tr><td>2.</td><td>Sector</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-4.5-EH-03739-2025-V1-NIELIT</td><td>5. NCrF/NSQF Level: 4.5</td></tr>
<tr><td>6.</td><td>Brief Description of the Standalone NOS</td><td colspan="2">This course provides a comprehensive understanding of the New Product Introduction (NPI) process in semiconductor fabrication. It covers the key stages of NPI, including design, development, validation, and production. The course emphasizes practical skills for managing the NPI process effectively.</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>Required Experience (with Specialization - if applicable)</th></tr>
<tr><td>1</td><td>3-Years Diploma in Electronics and Communication Engineering/ Electrical Engineering/ allied branches after class 10th</td><td>NA</td></tr>
<tr><td>2</td><td>3rd year of 3-Years Diploma in Electronics and Communication Engineering/ Electrical Engineering/ allied branches after class 10th</td><td>NA</td></tr>
<tr><td>3</td><td>1st year of UG in Electronics Engineering/Physics/ allied fields</td><td>NA</td></tr>
<tr><td>4</td><td>12th Pass</td><td>1.5 year experience in ESDM Sector</td></tr>
<tr><td>5</td><td>10th pass plus 2-year NTC in relevant field of Electronics Sector</td><td>1.5-year experience in ESDM Sector.</td></tr>
</table></td></tr>
</table>

<table>
<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): Category-I</td></tr>
<tr><td>10.</td><td>Any Licensing Requirements for Undertaking Training on This Qualification (wherever applicable)</td><td colspan="2">NA</td></tr>
<tr><td>11.</td><td>Training Duration by Modes of Training Delivery (Specify Total Duration as per selected training delivery modes and as per requirement of the qualification)</td><td colspan="2">☒Offline ☐Online ☐Blended
<table>
<tr><th>Training Delivery Modes</th><th>Theory (Hours)</th><th>Practical (Hours)</th><th>Total (Hours)</th></tr>
<tr><td>Classroom (offline)</td><td>18</td><td>42</td><td>60</td></tr>
</table></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 centralized online assessment is conducted by the Examination Wing, NIELIT Headquarters.
*Assessment strategy shall be as per NIELIT Norms prevailing at times.</td></tr>
<tr><td>13.</td><td>Is the NOS Amenable to Persons with Disability</td><td colspan="2">☒ Yes ☐ No
a. Locomotor Disability: Leprosy Cured Person, Dwarfism, Muscular Dystrophy and Acid Attack Victims
b. Visual Impairment: Low Vision</td></tr>
<tr><td>14.</td><td>Progression Path After Attaining the Qualification, wherever applicable</td><td colspan="2">MEMS Backend Fabrication Engineer-> Semiconductor Fabrication Engineer</td></tr>
<tr><td>15.</td><td>How participation of women will be encouraged?</td><td colspan="2">Participation by women can be ensured through Government Schemes. Occasionally, exclusive batches for women would be run for the proposed courses. Funding is available for women’s participation under other schemes launched by the Government from time to time.</td></tr>
<tr><td>16.</td><td>Other Indian languages in which the Qualification & Model Curriculum are being submitted</td><td colspan="2">Qualification file is available in English and Hindi languages.</td></tr>
<tr><td>17.</td><td>Is similar NOS available on NQR-if yes, justification for this qualification</td><td colspan="2">☐ Yes ☒ No</td></tr>
</table>

18.	**Name and Contact Details Submitting / Awarding Body SPOC** *(In case of CS or MS, provide details of both Lead AB & Supporting ABs)*	**Name:** Sh. Saurabh Kesari **Email:** saurabhk@nielit.gov.in **Contact No.:** 0240-2982021 **Website:** https://www.nielit.gov.in **Name:** Sh. Shashank Kumar Singh **Email:** shashank@nielit.gov.in **Contact No.:** 0240-2982021 **Website:** https://www.nielit.gov.in **Name:** Sh. Ravi Ranjan Kumar **Email:** raviranjan@nielit.gov.in **Contact No.:** 0240-2982021 **Website:** https://www.nielit.gov.in	
19.	**Final Approval Date by NSQC:18.02.2025**	**20. Validity Duration: 3 Years**	**21. Next Review Date: 18.02.2028**

Section 2: Training Related

1.	**Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	B.E./B. Tech in Electronics/ Electronics & Communication/ Electrical/ Electrical and Electronics/Instrumentation/ Electronics & Instrumentation / Instrumentation & Control and allied branches with 2 years of relevant experience in the field of Semiconductor Manufacturing / Semiconductor Fabrication and Packaging/VLSI Design. Or M.Sc. in Physics/Electronics/Material Science and allied branches; with 2 years of relevant experience in the field of Semiconductor Manufacturing / Semiconductor Fabrication and Packaging/VLSI Design.
2.	**Master Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	B.E./B. Tech in Electronics/ Electronics & Communication/ Electrical/ Electrical and Electronics/Instrumentation/ Electronics & Instrumentation / Instrumentation & Control and allied branches with 3 years of relevant experience in the field of Semiconductor Manufacturing /

		Semiconductor Fabrication and Packaging/VLSI Design. Or M.Sc. in Physics/Electronics/Material Science and allied branches; with 3 years of relevant experience in the field of Semiconductor Manufacturing / Semiconductor Fabrication and Packaging/VLSI Design.
3.	**Tools and Equipment Required for Training**	☒Yes ☐No Available at Annexure-II
4.	**In Case of Revised Qualification, Details of Any Upskilling Required for Trainer**	NA

Section 3: Assessment Related

1.	**Assessor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	B.E./B. Tech in Electronics/ Electronics & Communication/ Electrical/ Electrical and Electronics/Instrumentation/ Electronics & Instrumentation / Instrumentation & Control and allied branches with 3 years of relevant experience in the field of Semiconductor Manufacturing / Semiconductor Fabrication and Packaging/VLSI Design. Or M.Sc. in Physics/Electronics/Material Science and allied branches 3 years of relevant experience in the field of Semiconductor Manufacturing / Semiconductor Fabrication and Packaging/VLSI Design.
2.	**Proctor'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 comprise of MCQ. Conduct of assessment is through trained proctors. Once the test begins, remote proctors have full access to the candidate's video feeds and computer screens. Proctors authenticate the candidate based on registration details, pre-test image captured and I- card in possession of the candidate. Proctors can chat with candidates or give warnings to candidates. Proctors can also take screenshots, terminate a specific user's test session, or re-authenticate candidates based on video feeds.
3.	**Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)*	External Examiners/ Observers (Subject matter experts) are deployed including NIELIT scientific officers who are subject experts for evaluation of Practical examination/ internal assessment / Project/Presentation/ assignment and Major Project (if applicable). Qualification is generally B.Tech.

4.	**Assessment Mode** *(Specify the assessment mode)*	Centralized online examination will be conducted
5.	**Tools and Equipment Required for Assessment**	Same as for training ☒ Yes ☐ No

Section 4: Evidence of the Need for the Standalone NOS

1.	Government /Industry initiatives/ requirement (Yes/No): Yes
2.	Number of Industry validation provided: The course has been developed in collaboration with TATA Electronics to support the development of skilled manpower for the upcoming semiconductor industry.
3.	Estimated number of people to be trained: 500
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.

Section 5: Annexure & Supporting Documents Checklist

Specify Annexure Name / Supporting document file name

1.	**Annexure:** NCrF/NSQF level justification based on NCrF level/NSQF descriptors *(Mandatory)*	Available at Annexure-I: Evidence of Level
2.	**Annexure:** List of tools and equipment relevant for qualification *(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 selected Mode of delivery is "Blended Learning")*	Available at Annexure-V: Blended Learning

6.	**Annexure/Supporting Document:** Standalone NOS-Performance Criteria Details Annexure/Document with PC-wise detailing as per NOS format (Mandatory- Public view)	Available at Annexure-VI: Standalone NOS- Performance Criteria details
7.	**Annexure:** Detailed Assessment Criteria *(Mandatory)*	Available at Annexure-VII: 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 *(Mandatory – Public view)*	Available at Annexure-A: 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	Understand NPI stages, process flow, validation, yield enhancement, and risk mitigation strategies.	Provides foundational knowledge for managing NPI in semiconductor manufacturing while ensuring quality and process standards.	4.5
Professional and Technical Skills/ Expertise/ Professional Knowledge	Proficiency in NPI process flows, validation tools, yield analysis, and cross-functional coordination.	Equips learners with technical expertise to optimize NPI lifecycles in semiconductor manufacturing.	4.5
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	Prepared for roles like NPI Engineer; skilled in problem-solving, teamwork, and innovation.	Aligns job readiness and entrepreneurial skills with industry demands.	4.5
Broad Learning Outcomes/Core Skill and Responsibility	Plan and manage NPI lifecycle, ensuring product ramp-up, collaboration, and risk mitigation.	Prepares learners to own critical NPI tasks, ensuring successful product launches with measurable outcomes.	4.5

Annexure II: Tools and Equipment (Lab Set-Up)

Sl. No	Description	Qty.	Specifications
1	Classroom	1	30 Sq. m
2	Student Chair	30	-
3	Student Table	30	-
4	LCD Projector	1	-
5	Trainer Chair & Table	1	-
6	Pin up Board	1	-
7	White Board	1	-
8	Desktop Computer with accessories	30	Processor: Intel Core i5 (sixth generation newer) or equivalent Memory: 16GB RAM, Internal Storage: 500GB
9	Desk jet printer	1	A4

List of Tools and Equipment

Design and Development Tools
- CAD Software for Design (e.g., AutoCAD, SolidWorks)
- Design for Manufacturability (DFM) Tools
- Design for Testability (DFT) Tools
- Simulation Tools (e.g., ANSYS, Synopsys)

Validation and Qualification Tools
- Statistical Analysis Tools (SPC Software, DOE Tools)
- Qualification Equipment (DQ, IQ, OQ, PQ Documentation Tools)
- Process Monitoring Systems (MES Software)

Production Ramp-Up Tools
- Process Optimization Software
- Production Planning and Scheduling Tools
- Quality Control Systems (SPC, FMEA)

Market Launch Tools
- Customer Feedback Platforms
- Product Lifecycle Management (PLM) Software
- Analytics Tools for Post-Launch Monitoring

General Equipment

- Desktop Computers with Industry-Specific Software
- Projectors and Whiteboards for Collaboration

Annexure III: Industry Validations Summary

The course has been developed in collaboration with TATA Electronics to support the development of skilled manpower for the upcoming semiconductor industry.

Annexure IV: Training & Employment Details

Training Projections:

Year	Estimated Training # of Total Candidates	Estimated training # of Women	Estimated training # of People with Disability
2025-26	**100**	**50**	**10**
2026-27	**200**	**70**	**15**
2027-28	**200**	**70**	**15**

Data to be provided year-wise for next 3 years.

Annexure V: Blended Learning

Blended Learning Estimated Ratio & Recommended Tools: NA

Annexure VI: Performance Criteria details

1. **Description:**

   This course provides implementing the NPI process, including design, development, validation, production, and market launch, while ensuring manufacturability and emphasizes with applying DFM and DFT principles to optimize product designs, manage risks, and ensure efficient production in semiconductor manufacturing.

2. **Scope:**

   The scope covers the following:

   - The NPI (New Product Introduction) in Semiconductor Fab course covers the complete process of launching new semiconductor products, focusing on design, validation, production scaling, and market release while teaching practical skills like prototype development, process validation, and risk management.
   - Students gain hands-on skills and expertise through real-world case studies to excel in NPI teams.

3. **Elements and Performance Criteria**

   To be competent, the user/individual on the job must be able to:

Elements	Performance Criteria
Introduction to NPI in Semiconductor Fab	PC1: Overview and key stages of the NPI (New Product Introduction) process in semiconductor manufacturing, including design, development, validation, and production. PC2: Emphasis on the importance of NPI for gaining a competitive edge and mapping the NPI process for a semiconductor product.
Design and Development Phases	PC3: Apply Design for Manufacturability (DFM) and Design for Testability (DFT) principles, and develop prototypes and conduct pilot runs effectively. PC4: Lead design reviews, validate processes, and implement risk management and mitigation strategies throughout the product lifecycle.
Process Validation and Qualification	PC5: Perform process validation through Design, Process, and Production Validation to ensure manufacturing processes meet defined requirements. PC6: Apply statistical methods such as DOE and SPC to analyze validation data, ensuring process consistency,

	quality, and compliance with industry standards.
Production Ramp-Up and Scaling	PC7: Develop strategies for scaling up production while effectively managing ramp-up challenges. PC8: Ensure quality and consistency during scale-up through process optimization and continuous improvement.
Market Launch and Post-Launch Activities	PC9: Plan for market launch, manage product roll-out, and monitor post-launch performance with effective support. PC10: Handle customer feedback for iterative improvements and manage end-of-life (EOL) processes and product transitions efficiently.
Advanced Topics in NPI	PC11: Leverage innovations in NPI processes and tools, including the integration of digital technologies and automation. PC12: Manage NPI for complex, high-volume semiconductor products while staying updated on future industry trends.

4. Knowledge and Understanding (KU):

The individual on the job needs to know and understand:

KU1: Understand the key stages of the NPI process in semiconductor manufacturing, including design, development, validation, production, and market launch, and their critical impact on product success.
KU2: Comprehend DFM and DFT principles and their influence on product manufacturability and testability, ensuring efficient and reliable production outcomes.
KU3: Gain proficiency in validation techniques such as Design Validation, Process Validation, and Production Validation, along with qualification processes like DQ, IQ, OQ, and PQ, to ensure quality and compliance throughout manufacturing.

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

The user/individual on the job needs to know how to:

GS1: Develop the ability to identify potential manufacturability issues in semiconductor designs and apply critical thinking to find effective solutions, optimizing designs for higher yield and cost efficiency.
GS2: Improve their skills in effectively communicating technical information, collaborating with cross-functional teams (e.g., design, manufacturing, and testing), and presenting findings or design optimizations clearly.
GS3: Enhance attention to detail, ensuring that every aspect of the semiconductor design process from layout to material selection is carefully considered for manufacturability, quality, and process compatibility.

Annexure VII: Assessment Criteria

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

Elements	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Introduction to NPI in Semiconductor Fab	PC1: Overview and key stages of the NPI (New Product Introduction) process in semiconductor manufacturing, including design, development, validation, and production. PC2: Emphasis on the importance of NPI for gaining a competitive edge and mapping the NPI process for a semiconductor product.	16	10	-	-
Design and Development Phases	PC3: Apply Design for Manufacturability (DFM) and Design for Testability (DFT) principles, and develop prototypes and conduct pilot runs effectively.PC4: Lead design reviews, validate processes, and implement risk management and mitigation strategies throughout the product lifecycle.	17	10	-	-
Process Validation and Qualification	PC5: Perform process validation through Design, Process, and Production Validation to ensure manufacturing processes meet defined requirements. PC6: Apply statistical methods such as DOE and SPC to analyze validation data, ensuring process consistency, quality, and compliance with industry standards.	16	10	-	-
Production Ramp-Up and Scaling	PC7: Develop strategies for scaling up production while effectively managing ramp-up challenges. PC8: Ensure quality and consistency during scale-up through process optimization and continuous improvement.	17	10	-	-
Market Launch and Post-Launch Activities	PC9: Plan for market launch, manage product roll-out, and monitor post-launch performance with effective support. PC10: Handle customer feedback for iterative improvements and manage end-of-life (EOL) processes and product transitions efficiently.	17	10	-	-
Advanced Topics in NPI	PC11: Leverage innovations in NPI processes and tools, including the integration of digital technologies and automation. PC12: Manage NPI for complex, high-volume semiconductor products while staying updated on future industry trends.	17	10	-	-
Project	Including all Elements	-	-	20	-
Viva	Including all Elements	-	-	-	20
GRAND TOTAL		**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 (Online) examination.

About Examination Pattern:

1. The question papers for the theory exams are set by the Examination wing (assessor) of NIELIT HQS.

2. The assessor assigns roll number.

3. The assessor carries out theory online assessments. Theory examination would be conducted online and the paper comprise of MCQ

4. Pass percentage would be 50% marks.

5. The examination will be conducted in English language only.

Quality assurance activities: A pool of questions is created by a subject matter expert and moderated by other SME. Test rules are set beforehand. Random set of questions which are according to syllabus appears which may differ from candidate to candidate. Confidentiality and impartiality are maintained during all the examination and evaluation processes.

Annexure-IX: Acronym and Glossary

Acronym

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

Glossary

Term	Description
National Occupational Standards (NOS)	NOS define the measurable performance outcomes required from an individual engaged in a particular task. They list down what an individual performing that task should know and also do.
Qualification	A formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards
Qualification File	A Qualification File is a template designed to capture necessary information of a Qualification from the perspective of NSQF compliance. The Qualification File will be normally submitted by the awarding body for the qualification.
Sector	A grouping of professional activities on the basis of their main economic function, product, service or technology.