

QUALIFICATION FILE – Micro Credentials

Application of Machine Learning (Metal Sector)

☒ Public ☐ Private

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

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

NCrF/NSQF Level: 5

Submitted By:

Indian Iron and Steel Sector Skill Council (IISSC)

Karigari Bhawan, 5th Floor, Room No-509, Plot No-B/7,
Action Area-III, New Town, Rajarhat, Kolkata-700160

Table of Contents

Section 1: Basic Details 3

Section 2: Training Related 5

Section 3: Assessment Related 6

Section 4: Evidence of Need of the Micro Credential 7

Section 5: Annexure Check List 7

 Annexure: Evidence of Level 8

 Annexure: Learning Outcomes and Assessment Criteria 10

 Annexure: Assessment Strategy..... 11

 Annexure: Tools and Equipment 12

 Annexure: Industry Validations Summary 13

 Annexure: Training Details..... 13

 Annexure: Blended Learning..... 14

 Annexure: Acronym and Glossary 15

Section 1: Basic Details

1.	Micro Credential-Qualification Name	Application of Machine Learning (Metal Sector)		
2.	Sector/s	Iron & Steel		
3.	National Qualification Register (NQR) Code & Version (Will be issued after NSQC approval.)	NM-05-IS-04238-2025-V1-IISSSC	4. NCrF/NSQF Level: 5	
5.	Brief Description of the Micro Credential	This micro credential provides a comprehensive overview of machine learning applied to the steel industry. It covers Python fundamentals, explores machine learning and data analytics concepts, delves into core ML techniques, and specifically focuses on their applications in steel production. Participants learn relevant tools and techniques tailored for the steel industry, equipping them with practical skills for data-driven decision-making in steel manufacturing processes.		
6.	Eligibility Criteria for Entry for Students/Trainee/Learner/Employee	a. Entry Qualification & Relevant Experience		
		S. No.	Academic/Skill Qualification (with Specialization - if applicable)	Required Experience (with Specialization - if applicable)
		1.	12 th Pass or equivalent	no experience required
		2.	12th pass with 2-year NTC/NAC in relevant trade	1 year of experience in relevant field
		3.	3 year Diploma in Metallurgy / Mechanical / Electrical / Production	2 years of experience in relevant field
7.	Credits Assigned to this Qualification, Subject to Assessment (as per National Credit Framework (NCrF))	b. Age : 18		
		1	8. Common Cost Norm Category (I/II/III) (wherever applicable): I	
9.	Any Licensing Requirements/ Pre-requisites for Undertaking Training (wherever applicable)	No Licensing		
10.	Expected Outcomes of the Micro Credential	Terminal learning outcomes are: Define machine learning as a subset of artificial intelligence (AI).		

		- Identify the application of supervised learning in steel production for quality control, anomaly detection, predictive maintenance, and defect detection. - Utilize predictive maintenance techniques to reduce downtime and maintenance costs in steel production. - Create Python scripts to clean and preprocess raw sensor data from steel manufacturing equipment. - Install and configure popular machine learning libraries and tools like scikit-learn and TensorFlow. - Apply techniques for enhancing the interpretability and explainability of ML models for stakeholders in steel production.												
11.	Training Duration by Modes of Training Delivery <i>(Specify Total Duration as per selected training delivery modes and as per requirement of the qualification)</i>	☒ Offline Only ☐ Online Only ☐ 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>20</td><td>10</td><td>30</td></tr><tr><td>Online</td><td>0</td><td>0</td><td>0</td></tr></table> <i>(Refer Blended Learning Annexure for Details)</i>	Training Delivery Mode	Theory (Hours)	Practical (Hours)	Total (Hours)	Classroom (offline)	20	10	30	Online	0	0	0
Training Delivery Mode	Theory (Hours)	Practical (Hours)	Total (Hours)											
Classroom (offline)	20	10	30											
Online	0	0	0											
12.	Assessment Criteria	<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>40</td><td>60</td><td>0</td><td>0</td><td>100</td><td>70</td></tr></table>	Theory (Marks)	Practical (Marks)	Project (Marks)	Viva (Marks)	Total (Marks)	Passing %age	40	60	0	0	100	70
Theory (Marks)	Practical (Marks)	Project (Marks)	Viva (Marks)	Total (Marks)	Passing %age									
40	60	0	0	100	70									
13.	Is the Qualification Amenable to Persons with Disability	☒ Yes ☐ No If “Yes”, <i>specify applicable type of Disability</i>: Partial hearing disability Candidate should be able to communicate properly with/without aids.												
14.	How participation of women will be encouraged?	Equal employment opportunity is being given in the industry.												
15.	Other Indian Languages in which the Micro Credential will be implemented.	English only and Vernacular language												

16.	Is similar Micro Credential Qualification(s) available on NQR-if yes, justification for this qualification	☐ Yes ☒ No URLs of similar Qualifications:
17.	Name and Contact Details Submitting / Awarding Body SPOC	Name: Mr. Sushim Banerjee Email: ceo@iissc.org/ sushim_banerjee@yahoo.com Contact No.: 033-23247559 Website: https://www.iissc.org/
18.	Final Approval Date by NSQC: 08.05.2025	19. Validity Duration: 3 Years 20. Next Review Date: 08.05.2028

Section 2: Training Related

1.	Trainer's Qualification and experience in relevant sector (in years) (as per requirement and NCVET guidelines)	ITI (Computer Science/IT and other relevant domains) in the relevant discipline with minimum 3 years of experience in their professional fields (including minimum 2 years of relevant industry experience) Or Diploma (Computer Science/IT and other relevant domains) in the relevant discipline with minimum 2 years of experience in their professional fields (including minimum 2 years of relevant industry experience) Or BE/BTECH or higher (Computer Science/IT and other relevant domains) with minimum 2 years of experience in their professional fields with 1 year of relevant industry experience
2.	Master Trainer's Qualification and experience in relevant sector (in years) (as per requirement and NCVET guidelines)	B.Tech (Computer Science/IT and other relevant domains) with 6 years of industry and 2 year of training experience in metal casting
3.	Tools and Equipment Required for Training	☒ Yes ☐ No (If "Yes", details to be provided in Annexure)

Section 3: Assessment Related

1.	Assessor's Qualification and experience in relevant sector (in years) <i>(as per requirement and NCVET guidelines)</i>	ITI (Computer Science/IT and other relevant domains) in the relevant discipline with minimum 4 years of experience in their professional fields (including minimum 2 years of relevant industry experience) Or Diploma (Computer Science/IT and other relevant domains) in the relevant discipline with minimum 3 years of experience in their professional fields with 2 years of relevant industry experience Or BE/BTECH or higher (Computer Science/IT and other relevant domains) with minimum 3 years of experience in their professional fields with 1 year of relevant industry experience
2.	Proctor's Qualification and experience in relevant sector (in years) <i>(as per requirement and NCVET guidelines)</i>	B.Tech (Computer Science/IT and other relevant domains) with 5 years of industry and 2 year of assessment experience in metal casting
3.	Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years) <i>(as per requirement and NCVET guidelines)</i>	Diploma in the relevant discipline with a minimum of 10 years of experience in their professional fields with 3 years of relevant industry experience Or BE/BTECH or higher with minimum 7 years of experience in their professional fields with 5 year of relevant industry experience
4.	Assessment Mode <i>(Specify the assessment mode)</i>	Mode: ☐ Online Only ☒ Offline Only ☐ Blended
5.	Tools and Equipment Required for Assessment	☒ Same as for training ☐ Yes ☐ No <i>(details to be provided in Annexure-if it is different for Assessment)</i>

Section 4: Evidence of Need of the Micro Credential

As per the NCVET Guidelines for evidence of need, provide the required Annexure/Supporting documents.

1.	Government /Industry initiatives/ requirement (Yes/No): Yes
2.	Number of Industry validation provided: 5
3.	Estimated number of people to be trained: 1500

Section 5: Annexure Check List

Specify Annexure Number and Name.

1.	Annexure: NCrf/NSQF level justification based on NCrf Level/NSQF descriptors <i>(Mandatory)</i>	Attached
2.	Annexure: Learning Outcomes and Assessment Criteria <i>(Mandatory)</i>	Attached
3.	Annexure: Assessment Strategy <i>(Mandatory)</i>	Attached
4.	Annexure: List of tools and equipment relevant for qualification <i>(Mandatory – Except in case of online course)</i>	Attached
5.	Annexure: Blended Learning <i>(Mandatory in case selected mode of delivery is “Blended Learning”)</i>	Attached
6.	Annexure: Acronym and Glossary <i>(Optional)</i>	Attached

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
Professional Theoretical Knowledge/Process	- Integration of ML in Steel Quality Assurance Processes - Understanding Steel Production Processes - Quality Control Procedures in Steel Plants - Application of Machine Learning Algorithms for Predictive Maintenance - Optimization of Production Processes Using ML Techniques	The job role in machine learning for steel plants at NSQF Level 4 entails a deep understanding of theoretical concepts and processes in machine learning applied to steel production. This includes proficiency in data analysis, modeling, and algorithm development, enabling efficient optimization and automation of steel manufacturing processes.	5
Professional and Technical Skills/ Expertise/ Professional Knowledge	- Basic understanding of Metallurgy - Knowledge of metal casting processes and functions - Proficiency in operating parameters relevant to metal casting - Ability to conduct workplace inspections for quality control purposes	At NSQF Level 4, professionals acquire theoretical knowledge of machine learning's application in steel plants, including data preprocessing, feature engineering, and model selection. They develop expertise in implementing regression, classification, and clustering algorithms tailored to steel production processes. Practical skills in data analysis, model evaluation, and optimization are emphasized for effective decision-making.	5
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	- Proficiency in the functioning of metal casting processes - Skill in inspecting workplaces for quality control purposes - Strong communication skills for collaborating with diverse teams - Analytical thinking to interpret machine learning data for process optimization	This NSQF Level 4 program integrates employment readiness and entrepreneurship skills with professional expertise in machine learning for steel plants. Participants develop a mindset for innovation and problem-solving alongside mastering technical skills in data analytics, predictive maintenance, and process optimization, enhancing employability and fostering entrepreneurial initiatives in the steel industry.	5

Broad Learning Outcomes/Core Skill	- Ability to inspect the workplace for quality control and assurance in accordance with industry standards - Knowledge of operating parameters crucial for metal casting operations	Participants attain expertise in implementing machine learning techniques for optimizing steel plant operations. They gain proficiency in Python programming, data analytics, and core ML algorithms. This NSQF Level 4 credential equips them with advanced skills in applying machine learning to enhance efficiency, productivity, and decision-making processes within steel manufacturing environments.	5
Responsibility	- Design and implement machine learning models. - Assess the performance of machine learning models using appropriate metrics and techniques, validating their effectiveness in real-world steel manufacturing scenarios. - Continuously monitor model performance and iterating on improvements to enhance predictive accuracy, reliability, and efficiency in steel production processes.	At NSQF Level 4, the Responsibility for Professional and Technical Skills/Expertise/Professional Knowledge in machine learning for steel plants involves advanced understanding and application of ML techniques. Professionals are expected to demonstrate proficiency in data analysis, model development, and implementation to optimize processes, enhance productivity, and ensure quality control within steel manufacturing environments.	5

Annexure: Learning Outcomes and Assessment Criteria

Detailed learning outcomes and assessment criteria for the qualification are as follows:

S. No.	Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC 1.	Write basic Python code.	0	5	0	0
PC 2.	Develop Python scripts for cleaning and preprocessing raw sensor data from steel manufacturing equipment.	2	5	0	0
PC 3.	Create scripts automating repetitive tasks.	3	4	0	0
PC 4.	Develop and train supervised learning models utilizing historical steel production data.	2	3	0	0
PC 5.	Design and implement real-time monitoring systems utilizing machine learning algorithms to enhance process control and decision-making in steel manufacturing operations.	2	3	0	0
PC 6.	Investigate and apply reinforcement learning techniques to optimize resource allocation and scheduling within steel production facilities.	3	5	0	0
PC 7.	Manage high-dimensional data from multiple sensors by employing techniques like Principal Component Analysis (PCA) or t-distributed Stochastic Neighbor Embedding (t-SNE) to extract relevant features for steel manufacturing.	2	1	0	0
PC 8.	Design and implement data acquisition systems for real-time sensor data collection.	4	5	0	0
PC 9.	Apply data visualization techniques to identify patterns in steel production data.	2	5	0	0
PC 10.	Integrate machine learning models into production systems for automated decision-making.	3	5	0	0
PC 11.	Collaborate with teams to identify and prioritize machine learning use cases.	3	5	0	0
PC 12.	Conduct sensitivity analysis to assess model robustness to variations.	2	1	0	0
PC 13.	Implement model explainability techniques for transparent solutions.	3	1	0	0
PC 14.	Perform cost-benefit analysis for quantifying improvements.	2	5	0	0
PC 15.	Evaluate scalability and deployment feasibility across facilities.	3	1	0	0
PC 16.	Configure popular machine learning libraries and tools like scikit-learn and TensorFlow on a local development environment.	2	3	0	0
PC 17.	Identify and troubleshoot common errors and issues encountered while utilizing these libraries/tools in steel production applications.	2	3	0	0
Total Marks		40	60	0	0

Annexure: 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.

Mention the detailed assessment strategy in the provided template.

1. Assessment System Overview:

- Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
- Assessment agencies send the assessment confirmation to VTP/TC looping SSC
- Assessment agency deploys the ToA certified Assessor for executing the assessment
- SSC monitors the assessment process & records

2. Testing Environment:

- Confirm that the centre is available at the same address as mentioned on SDMS or SIP
- Check the duration of the training.
- Check the Assessment Start and End time to be as 10 a.m. and 5 p.m.
- Metal Casting 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.
- Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
- Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
- Check the availability of the Lab Equipment for the particular Job Role.

3. Assessment Quality Assurance levels / Framework:

- Question papers created by the Subject Matter Experts (SME)
- Question papers created by the SME verified by the other subject Matter Experts
- Questions are mapped with NOS and PC
- Question papers are prepared considering that level 1 to 3 is for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
- Assessor must be ToA certified & trainer must be ToT Certified
- Assessment agency must follow the assessment guidelines to conduct the assessment

4. Types of evidence or evidence-gathering protocol:

- Time-stamped & geotagged reporting of the assessor from assessment location
- Centre photographs with signboards and scheme specific branding

- Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
 - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos
5. Method of verification or validation:
- Surprise visit to the assessment location
 - Random audit of the batch
 - Random audit of any candidate
6. Method for assessment documentation, archiving, and access
- Hard copies of the documents are stored
 - Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage
 - Soft copies of the documents & photographs of the assessment are stored in the Hard Drives

Annexure: Tools and Equipment

List of Tools and Equipment

Batch Size: 30

S. No.	Tool / Equipment Name	Specification	Quantity for specified Batch size
1	Python	As per requirement	30
2	Laptop	As per requirement	30
3	Whiteboard	All	1
4	Note book	As per requirement	30

Classroom Aids:

The aids required to conduct sessions in the classroom are:

1. Whiteboard and marker
2. Projector
3. Laptop
4. Internet

Annexure: Industry Validations Summary

S. No	Organization Name	Representative Name	Designation	Contact Address	Contact Phone No	E-mail ID	LinkedIn Profile (if available)
1	ArcelorMittal Nippon Steel India Ltd.	Mr. Prakash Hegde	DGM	27 th km, Surat-Hazira Rd., Hazira, Surat 394270, Gujarat	9909901396	Prakash.hegde@amns.in	
2	IPS Contractors & Labour Suppliers	Mr. Tosif Shaikh	IPS Contractors	Pithampur Disst. Dhar (MP) 454775	9907590590	hr.ipscontractors@gmail.com	
3	Tata Steel Mining Ltd.	Mr. Ajay Kumar Singh	AGM-HR	Bhubaneswar, Odisha – 751015	9234511004	a.singh@tatasteelmining.com	
4	Tata Steel Ltd	Mr. Padmapal	Chief of Blast Furnaces	Mumbai	9234567561	Padma.pal@tatasteel.com	
5	Rourkela Steel Plant	H. Pati	GM	Rourkela 769011	8895500593		

Annexure: Training Details

Training Projections:

Year	Estimated Training # of Total Candidates	Estimated training # of Women	Estimated training # of People with Disability
2024-25	500	200	50
2025-26	1000	400	100
2026-27	1500	600	150

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

Annexure: Blended Learning

Blended Learning Estimated Ratio & Recommended Tools:

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	• Books/ e-books • Presentations • Reference Material • Audio / Video Modules	
2	☒ Imparting Soft Skills, Life Skills and Employability Skills /Mentorship to Learners	• Self-Learning Videos • Broadcasts • Mobile Learning • Curated Digital content	
3	☒ Showing Practical Demonstrations to the learners	• Video Content • E-Resource library • AR/VR/XR	
4	☒ Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	• Training tools (tools list attached) • Video Play • Presentations	
5	☒ Tutorials/ Assignments/ Drill/ Practice	• Online Question Bank • Mobile Quick test app • MCQ based tests	

6	☒ Proctored Monitoring/ Assessment/ Evaluation/ Examinations	• Assessment engine for Essays • Up-loadable file examinations • Mock test sessions	
7	☒ On the Job Training (OJT)/ Project Work Internship	• Online tests • Offline assessments	

Annexure: Acronym and Glossary

Acronym

Acronym	Description
AA	Assessment Agency
AB	Awarding Body
ISCO	International Standard Classification of Occupations
NCO	National Classification of Occupations
NCrF	National Credit Framework
NQR	National Qualification Register
NSQF	National Skills Qualifications Framework
OJT	On the Job Training
CAD/CAM	Computer-aided design and computer-aided manufacturing
CAE	Computer-aided engineering

Glossary

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