QUALIFICATION FILE – Standalone NOS

Foundation of Data Science and Analytics

☐ 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

Table of Contents

Section 1: Basic Details

<table>
<tr><td>1.</td><td>NOS-Qualification Name</td><td colspan="2">Foundation of Data Science and Analytics</td></tr>
<tr><td>2.</td><td>Sector/s</td><td colspan="2">IT-ITeS</td></tr>
<tr><td>3.</td><td>Type of Qualification ☒ New ☐ Revised</td><td>NQR Code & version of the existing /previous qualification: (change to previous, once approved): NA</td><td>Qualification Name of the existing/previous version: (previous, once approved): NA</td></tr>
<tr><td>4.</td><td>National Qualification Register (NQR) Code & Version (Will be issued after NSQC approval.)</td><td>NG-3.5-IT-03725-2025-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 Foundation of Data Science and Analytics course offers a thorough introduction to data science, equipping learners with key skills needed in this field. The curriculum includes fundamental concepts, data science workflows, and distinctions from data analytics and machine learning. It covers programming in Python or R, using libraries like NumPy and Pandas, and techniques in data preprocessing, statistical analysis, and visualization with tools such as Matplotlib and Seaborn. The course also introduces machine learning, NLP, and time series analysis, supplemented with real-world case studies from various industries and focuses on ethical practices and data privacy. This course is ideal for beginners seeking a strong foundation in data science.</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>Academic/Skill Qualification (with Specialization - if applicable)</th><th>Required Experience (with Specialization - if applicable)</th></tr>
<tr><td>Grade 10 pass and pursuing continuous schooling*</td><td>No experience required</td></tr>
<tr><td>Grade 8 with 2 years of NTC in the field of IT Sector*</td><td>No experience required</td></tr>
<tr><td>Grade 8th pass*</td><td>3 Year relevant experience in IT</td></tr>
<tr><td>Previous NSQF Level 3 Required</td><td>1.5 year relevant experience in IT</td></tr>
</table>
*Should have a basic understanding of coding.</td></tr>
<tr><td>8.</td><td>Credits Assigned to this NOS-Qualification, Subject to Assessment (as per National Credit Framework (NCrF))</td><td>4 Credits</td><td>9. Common Cost Norm Category (I/II/III) (wherever applicable): Category-II</td></tr>
</table>

<table>
<tr><td>10.</td><td>Any Licensing Requirements for Undertaking Training on This Qualification (wherever applicable)</td><td>No</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>☒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>45</td><td>75</td><td>120</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.
(Refer Blended Learning Annexure-V for details)</td></tr>
<tr><td>12.</td><td>Assessment Criteria</td><td><table><tr><th>Theory (Marks)</th><th>Practical (Marks)</th><th>Project/Presentation/ Assignment (Marks)</th><th>Viva/Internal Assessment (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>☒ 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 (Please show Professional and Academic progression)</td><td>Academic:
Vertical:
Level 4: AI Application Associate

Professional:
AI Application Developer (AI)->Senior AI Application Developer (AI)-> AI Engineer-> Machine Learning Engineer -> AI Research Scientists</td></tr>
<tr><td>15.</td><td>How participation of women will be encouraged?</td><td>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>
</table>

16.	**Other Indian languages in which the Qualification & Model Curriculum are being submitted**	Qualification file is available in English and Hindi languages.	
17.	**Is similar NOS available on NQR-if yes, justification for this qualification**	**☐ Yes ☒ No URLs of similar Qualifications:**	
18.	**Name and Contact Details Submitting / Awarding Body SPOC** *(In case of CS or MS, provide details of both Lead AB & Supporting ABs)*	Name: Shri. Binoy Das Email: erbinoy@nielit.gov.in Contact No.: 9436585656 Website: https://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)*	A-Level/MCA/ B. Tech in CS/IT/EC/EE/ allied areas with 1 years of experience in training in relevant field.
2.	**Master Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)*	MCA/B-Level/B.Tech in CS/IT/EC/EE/ allied areas with 2 years of experience/ 2 years of training in relevant field.
3.	**Tools and Equipment Required for the Training**	☒Yes ☐No (If "Yes", details to be provided in Annexure-II)
4.	**In Case of Revised NOS, 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)*	A-Level/MCA/ B. Tech in CS/IT/EC/EE/ allied areas with 2 year of experience of training in relevant field.
2.	**Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines), (wherever applicable)*	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 (details to be provided in Annexure-if it is different for Assessment)

Section 4: Evidence of the Need for the Standalone NOS

Provide Annexure/Supporting documents name.

1.	Government /Industry initiatives/ requirement (Yes/No): Yes
2.	Number of Industry validation provided: The QF/NOS/Micro credentials are offered through IndiaAi Labs for Empowering the youth by imparting training in Emerging AI Technologies under India AI Future Skills pillar of IndiaAI Mission.
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): (Yes/No):

	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 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 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)	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: Detailed 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	This qualification prepares individuals for data science roles with expertise in Python/R programming, data preprocessing, and machine learning techniques. Graduates will gain hands-on experience through real-world case studies, mastering tools like Pandas, Matplotlib, and Jupyter while solving industry-specific problems. Emphasis on ethical practices and data privacy ensures readiness for roles like Data Analyst.	The job role and outcomes align with NCrF/NSQF Level 4 or 5, emphasizing advanced theoretical knowledge and practical skills in data science and analytics. Learners are equipped to independently handle complex datasets, solve real-world problems, and apply machine learning techniques while adhering to ethical standards. These competencies reflect the level descriptors' focus on specialized knowledge, analytical skills, and professional accountability across diverse industries.	**3.5**
Professional and Technical Skills/ Expertise/ Professional Knowledge	The qualification equips individuals with professional and technical expertise in programming languages like Python and R, alongside data manipulation and analysis using tools such as NumPy, Pandas, and Jupyter Notebook. Graduates gain proficiency in data preprocessing techniques, statistical analysis, data visualization with Matplotlib and Seaborn, and machine learning algorithms like regression, clustering, and hyperparameter tuning. Advanced knowledge includes exploratory data analysis (EDA), model validation, natural language processing (NLP), and time series analysis. Additionally, learners develop domain-specific skills for applications in finance, healthcare, and e-commerce, while emphasizing ethical data handling and privacy practices to ensure responsible and secure professional practice.	Factual knowledge of field of knowledge or study.	**3.5**
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	This qualification prepares learners for employment readiness by equipping them with in-demand skills in programming, data analysis, and machine learning, enabling them to take on roles like Data Analyst. Through hands-on projects and case studies, they develop problem-solving abilities, innovation, and effective communication, ensuring they can independently manage	Recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts	**3.5**

	real-world data challenges. Additionally, the program fosters an entrepreneurial mindset, encouraging learners to identify opportunities for data-driven innovation while emphasizing ethical practices and collaboration in professional environments.		
Broad Learning Outcomes/Core Skill	They will be able to handle alone as well as in /with the team in the area as per the curriculum	Language to communicate written or oral, with required clarity, skill to basic arithmetic and algebraic principles, basic understanding of social political and natural environment.	**3.5**
Responsibility	Graduates of this qualification are equipped to take on significant responsibilities, including independently managing data science projects from data acquisition and preprocessing to model development and deployment. They are responsible for ensuring data quality, performing in-depth analyses, and deriving actionable insights while adhering to ethical standards and data privacy regulations. Additionally, they are expected to effectively communicate findings, collaborate with interdisciplinary teams, and contribute to decision-making processes in organizational or entrepreneurial settings, showcasing accountability and professional integrity in their roles.	Responsibility for own work and learning.	**3.5**

Annexure-II: Tools and Equipment (lab set-up)

List of Tools and Equipment
Batch Size: 20

S. No.	Tool / Equipment Name	Specification	Quantity for specified Batch size
1	Classroom	1 (30 Sq.m)	20

2	Student Chair	30	20
3	Student Table	30	20
4	Desktop computer with accessories	• 12th Generation Intel® Core™ i5-12500T with Intel vPro® Enterprise • 8 GB DDR4-3200 MHz RAM (1 x 8 GB) • 512 GB PCIe® NVMe™ M.2 SSD • Intel® UHD Graphics 770 • Windows 11 Professional Installation of Python and R, including development environments like Jupyter Notebook, Anaconda Distribution, Comprehensive libraries such as pandas, numpy, matplotlib, scikit-learn (for Python) and dplyr, ggplot2, caret (for R), Office Package.	20
5	Desk jet printer	1 Nos.	A4

Classroom Aids

The aids required to conduct sessions in the classroom are:

1. LCD Projector/Smart Board
2. Pin-up Board
3. White Board, Markers

Annexure-III: Industry Validations Summary

* Course is to be offered through IndiaAi Labs for Empowering the youth by imparting training in Emerging AI Technologies under India AI Future Skills pillar of IndiaAI Mission.

Annexure-IV: Training Details

Training Projections:

Year	Estimated Training # of Total Candidates	Estimated training # of Women	Estimated training # of People with Disability
2025	1000	200	10
2026	1000	250	15
2027	1000	300	20

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

Annexure-V: Blended Learning

Blended Learning Estimated Ratio & Recommended Tools:

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 JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	60:40
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 JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	60:40
4	☒Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	PCs/Laptops	100:0

5	☒Tutorials/ Assignments/ Drill/ Practice	Online interaction platforms like JitSi Meet, Bharat VC, Google Meet, MS Teams, etc.	50:50
6	☒Proctored Monitoring/ Assessment/ Evaluation/ Examinations	NIELIT Online Examination	Online: 100% Theory; Offline 100% Practical
7	☐On the Job Training (OJT)/ Project Work Internship/ Candidate Training	NA	NA

Annexure-VI: Performance Criteria details

1. **Description:**

The Foundation of Data Science and Analytics course provides a comprehensive introduction to the field of data science, equipping learners with essential skills and knowledge to excel in this dynamic domain. The course begins with an exploration of data science fundamentals, including its definition, scope, and real-world applications, and clarifies distinctions between data science, data analytics, and machine learning. Participants will delve into the data science workflow, encompassing data acquisition, preprocessing, exploratory data analysis (EDA), modeling, and deployment. Foundational programming skills in Python or R are covered, alongside critical libraries like NumPy and Pandas for data manipulation. Learners will explore data preprocessing techniques, statistical analysis, and visualization tools such as Matplotlib and Seaborn. Key machine learning concepts, algorithms, and advanced topics like NLP and time series analysis are introduced, along with techniques like hyperparameter tuning and cross-validation. Real-world case studies in industries like finance, healthcare, and e-commerce provide practical context, while ethical considerations and data privacy ensure responsible project execution. This course is ideal for aspiring students looking to build a solid foundation in data science.

2. **Scope:**

The scope covers the following:

- Covers data acquisition, preprocessing, exploratory data analysis (EDA), modeling, and deployment.
- Develops proficiency in Python or R, along with essential libraries like NumPy, Pandas, Matplotlib, and Seaborn for data manipulation, analysis, and visualization.
- Introduces key machine learning concepts, algorithms, NLP, time series analysis, and advanced techniques like hyperparameter tuning and cross-validation.

3. Elements and Performance Criteria

Fundamentals of Data Science:

PC1. Explain the concept, scope, and applications of data science across industries.

PC2. Differentiate between data science, data analytics, and machine learning.

PC3. Outline the key stages of the data science process, including data acquisition, preprocessing, EDA, modeling, and deployment.

Foundational in Python Programming:

PC4. Successfully set up the Python environment and execute basic scripts without errors.

PC5. Explain key AI concepts, including machine learning, deep learning, computer vision, and NLP, with relevant industry examples.

PC6. Differentiate between supervised and unsupervised learning approaches and explain the importance of data annotation.

Machine Learning Fundamentals:

PC7. Apply data preprocessing techniques and perform feature extraction.

PC8. Utilize statistical methods to understand and interpret data.

PC9. Create effective data visualizations to uncover insights.

Foundational in R Programming:

PC10. Navigate the RStudio environment and execute basic R commands.

PC11. Perform essential data handling operations, including importing, cleaning, and organizing datasets.

Data Analysis Concepts and Techniques:

PC12. Conduct Exploratory Data Analysis (EDA) using Python libraries like Matplotlib and Seaborn

PC13. Apply statistical techniques and probability concepts for data-driven decision making.

PC14. Perform time series analysis to identify trends and make accurate forecasts.

PC15. Implement NLP techniques for sentiment analysis and text classification.

Case Studies and Industry Applications of Data Science:

PC16. Analyze data science case studies in finance, healthcare, and e-commerce.

PC17. Evaluate ethical considerations such as bias, fairness, and data privacy principles.

PC18. Apply best practices for secure and ethical data handling in real-world scenarios.

4. Knowledge and Understanding (KU):

The individual on the job needs to know and understand:

KU1. Learners gain knowledge of the definition, scope, and applications of data science, as well as distinctions between data science, data analytics, and machine learning.

KU2. Learners understand the data science workflow, including data acquisition, preprocessing, exploratory data analysis, and modeling, alongside programming expertise in Python or R and familiarity with libraries like NumPy, Pandas, Matplotlib, and Seaborn.

KU3. Learners acquire foundational knowledge of machine learning concepts, algorithms, and advanced techniques such as NLP and time series analysis, while also understanding the importance of ethical considerations and data privacy in data science projects.

5. Generic Skills (GS):

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

GS1. Follow instructions, guidelines and procedures

GS2. Listen effectively and communicate information accurately

GS3. Apply formatting features to achieve the desired results

Annexure-VII: Assessment Criteria

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

NOS/Module Name	Assessment Criteria for Performance Criteria	Theory Marks	Practical Marks	Project Marks	Viva Marks
Foundation of Data Science and Analytics **NOS Code: NIE/SSC/N1018**	**Fundamentals of Data Science:** PC1. Explain the concept, scope, and applications of data science across industries. PC2. Differentiate between data science, data analytics, and machine learning. PC3. Outline the key stages of the data science process, including data acquisition, preprocessing, EDA, modeling, and deployment.	20	10	4	4
	Foundational in Python Programming: PC4. Successfully set up the Python environment and execute basic scripts without errors. PC5. Explain key AI concepts, including machine learning, deep learning, computer vision, and NLP, with relevant industry examples. PC6. Differentiate between supervised and unsupervised learning approaches and explain the importance of data annotation.	20	10	4	4
	Machine Learning Fundamentals: PC7. Apply data preprocessing techniques and perform feature extraction. PC8. Utilize statistical methods to understand and interpret data. PC9. Create effective data visualizations to uncover insights.	20	10	4	4
	Foundational in R Programming: PC10. Navigate the RStudio environment and execute basic R commands. PC11. Perform essential data handling operations, including importing, cleaning, and organizing datasets.	20	10	4	4
	Data Analysis Concepts and Techniques: PC12. Conduct Exploratory Data Analysis (EDA) using Python libraries like Matplotlib and Seaborn	10	10	2	2

	PC13. Apply statistical techniques and probability concepts for data-driven decision making. PC14. Perform time series analysis to identify trends and make accurate forecasts. PC15. Implement NLP techniques for sentiment analysis and text classification.				
	Case Studies and Industry Applications of Data Science: PC16. Analyze data science case studies in finance, healthcare, and e-commerce. PC17. Evaluate ethical considerations such as bias, fairness, and data privacy principles. PC18. Apply best practices for secure and ethical data handling in real-world scenarios.	10	10	2	2
Total Marks		**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.