



Model Curriculum

NOS Name: Foundation course in Data Analysis (Manufacturing)

NOS Code: ASC/N6461

NOS Version: 1.0

NSQF Level: 5.5

Model Curriculum Version: 1.0

Automotive Skills Development Council | E 113, Okhla Industrial Area, Phase – III,
New Delhi – 110020

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Training Parameters

Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Production Engineering
Country	India
NSQF Level	5.5
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2120.0300
Minimum Educational Qualification and Experience	UG Diploma in relevant field with 1.5 Years of Relevant experience OR 3 rd year of UG Degree in relevant field OR Diploma after 10th in relevant field with 3 Years of Relevant experience
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Next Review Date	15/03/2027
NSQC Approval Date	15/03/2024
QP Version	1.0
Model Curriculum Creation Date	15/03/2024
Model Curriculum Valid Up to Date	15/03/2027
Model Curriculum Version	1.0

Minimum Duration of the Course	60 Hours
Maximum Duration of the Course	60 Hours

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes:

At the end of the program, the learner should have acquired the listed knowledge and skills.

- Acquire a foundational understanding of statistical concepts relevant to manufacturing data analysis, such as measures of central tendency, variability, and probability distributions.
- Effectively Collect, Prepare & Process the Data from Manufacturing entities.
- Creating effective visualizations to represent manufacturing data, using tools such as charts, graphs, and dashboards for better interpretation.
- Techniques for analyzing time-series data commonly found in manufacturing, including trend analysis, seasonality detection, and forecasting.

Sub-NOS Details	Theory Duration	Practical Duration	On-the-Job Training Duration	Total Duration
ASC/N6461- Foundation course in Data Analysis (Manufacturing), NSQF Level- 5.5	15:00	45:00	00:00	60:00
Module: 1 -Introduction to Foundation course in Data Analysis (Manufacturing), Mapped to ASC/N6461	05:00	00:00	00:00	05:00
Module: 2 - Foundation course in Data Analysis (Manufacturing), Mapped to ASC/N6461	10:00	45:00	00:00	55:00
Total Duration	15:00	45:00	00:00	60:00

Module Details

Bridge Module-1 Introduction to Foundation course in Data Analysis (Manufacturing) Mapped to ASC/N6461

Terminal Outcomes:

- Demonstrate a comprehensive understanding of the role and significance of data analysis in the context of manufacturing processes.

Duration: <5:00>	Duration: <00:00>
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<p>Introduction to Manufacturing Data:</p> <p>Significance of data in the context of manufacturing processes, including its role in decision-making, process improvement, and quality control.</p> <p>Data Transformation:</p> <p>Different types of manufacturing data and how they are collected Learning the basics of data cleaning, preparation, and transformation</p> <p>Statistical Foundations:</p> <p>Statistical concepts relevant to data analysis, including measures of central tendency, dispersion, and probability distributions.</p>	
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
IIOT Sensor, I/O Link, Data Analysis Software	

Module: 2 Foundation course in Data Analysis (Manufacturing)

Mapped to ASC/N6461

Terminal Outcomes:

- Identify and comprehensively understand the various data sources within manufacturing entities, including sensors, machines, quality control systems, and enterprise databases.
- Develop a strategic approach for collecting manufacturing data, considering factors such as frequency, volume, and relevance to key performance indicators.
- Master various data collection techniques, including manual entry, automated logging, and real-time data streaming from manufacturing processes.
- Demonstrate proficiency in cleaning manufacturing data by addressing issues such as missing values, outliers, and inconsistencies.
- Integrate data from different sources within manufacturing entities, creating a unified dataset for comprehensive analysis.

Duration: <10:00>	Duration: <45:00>
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<p>Data Collection: Understanding Data Sources:</p> <ul style="list-style-type: none"> • Different data sources in manufacturing entities, such as sensors, production logs, and quality control systems. <p>Data Collection Methods:</p> <ul style="list-style-type: none"> • Methods for collecting data in manufacturing, including automated data acquisition, manual entry, and integration with enterprise systems. <p>Real-Time Data Acquisition:</p> <ul style="list-style-type: none"> • Principles and technologies involved in real-time data acquisition, crucial for monitoring and control in manufacturing processes. <p>Data Types and Characteristics: Recognition of Data Types:</p> <ul style="list-style-type: none"> • Categorize different types of data encountered in manufacturing, including numerical, categorical, and time-series data. 	<p>Data Collection: Data Source Identification:</p> <ul style="list-style-type: none"> • Identify and access various sources of data in manufacturing entities, such as sensors, machines, databases, and manual records. <p>Data Collection Methods:</p> <ul style="list-style-type: none"> • Demonstrate proficiency in employing different data collection methods, including automated data logging systems, sensor networks, and manual data entry. <p>Data Sampling Techniques:</p> <ul style="list-style-type: none"> • Apply practical data sampling techniques to ensure representative datasets for analysis while considering factors such as time intervals and production cycles. <p>Data Cleaning and Preprocessing: Data Cleaning Techniques:</p> <p>Use practical techniques to clean raw data, addressing issues like missing values, outliers, and inconsistencies</p>

<p>Data Quality Attributes:</p> <ul style="list-style-type: none"> Attributes of data quality, such as accuracy, completeness, consistency, and timeliness, and their significance in manufacturing data. <p>Data Preprocessing:</p> <p>Cleaning and Validation:</p> <ul style="list-style-type: none"> Techniques for cleaning and validating manufacturing data to ensure accuracy and reliability in subsequent analyses. <p>Handling Missing Data:</p> <ul style="list-style-type: none"> Methods for handling missing data, including imputation methods and their implications in manufacturing contexts. <p>Outlier Detection and Treatment:</p> <ul style="list-style-type: none"> Techniques for detecting and handling outliers in manufacturing data to prevent their impact on analysis results. 	<p>that may arise in manufacturing datasets.</p> <p>Normalization and Transformation:</p> <ul style="list-style-type: none"> Apply normalization and transformation methods to prepare data for analysis, ensuring compatibility and consistency across different variables. <p>Handling Noisy Data:</p> <ul style="list-style-type: none"> Implement strategies to handle noisy data and mitigate the impact of errors or irregularities in the manufacturing dataset. <p>Data Integration:</p> <p>Merge and Consolidate Data:</p> <ul style="list-style-type: none"> Practice merging and consolidating data from diverse sources to create a unified dataset, enabling a holistic view of manufacturing processes. <p>Data Alignment:</p> <ul style="list-style-type: none"> Demonstrate the ability to align data from different sources, ensuring temporal and spatial consistency for meaningful analysis.
<p>Classroom Aids:</p>	
<p>Whiteboard, marker pen, projector</p>	
<p>Tools, Equipment and Other Requirements</p>	
<ul style="list-style-type: none"> Industrial Sensors, Controllers, Actuators, Programming Software, Data Analysis Software, Simulation Software 	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training Experience		Remarks
		Years	Specialization	Years	Specialization	
B.E/B.Tech	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	3	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	1	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	NA
B.E/B.Tech	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	4	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	0	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	NA
Diploma	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	5	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	1	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	NA
Diploma	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	6	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	0	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	NA

Trainer Certification	
Domain Certification	Platform Certification
“Foundation course in Data Analysis (Manufacturing), ASC/N6461, version 1.0”. Minimum accepted score is 80%	Recommended that the trainer is certified for the job role “Trainer (VET and Skills)”, Mapped to Qualification Pack: MEP/Q2601, V2.0” Minimum accepted score is 80%.

Assessor Requirements

Trainer Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training Experience		Remarks
		Years	Specialization	Years	Specialization	
B.E/B.Tech	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	3	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	1	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	NA
B.E/B.Tech	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	4	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	0	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	NA
Diploma	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	5	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	1	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	NA
Diploma	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	6	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	0	Mechanical/Automobile /Mechatronics/Electronics/Electrical/ Manufacturing	NA

Assessor Certification	
Domain Certification	Platform Certification
“Foundation course in Data Analysis (Manufacturing), ASC/N6461, version 1.0”. Minimum accepted score is 80%	Recommended that the Assessor is certified for the job role “Assessor (VET and Skills)”, Mapped to Qualification Pack: MEP/Q2701, V2.0” Minimum accepted score is 80%.

Assessment Strategy

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.
 - 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.
 - Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
 - Confirm the number of TABs on the ground is 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 Semester-wise Curriculum.
 - Question papers are prepared considering that level 1 to 3 are 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

References

Glossary

Term	Description
Declarative Knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning Outcome	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work, or produce a tangible work output by applying cognitive, affective or psychomotor skills.
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do upon the completion of the training.
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
AMC	Annual Maintenance Contract
PPE	Personal Protective Equipment