Model Curriculum

QP Name: AI Embedded Product Developer (Electronics)

OEM Name: SIC - Artificial Intelligence

QP Code: ELE/Q1407

QP Version: 1.0

NSQF Level: 4.5

Model Curriculum Version: 1.0

Electronics Sector Skills Council of India || 155, 2nd Floor, ESC House, Okhla Industrial Area - Phase 3, New Delhi – 110020

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Training Parameters

Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Product Design (S&C)
Country	India
NSQF Level	4.5
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2511.0106
Minimum Educational Qualification and Experience	UG Certificate (Electronics/Electrical/Computer science/Artificial Intelligence) OR 3 Year diploma after 10th (Electronics/Electrical/Computer science/Artificial Intelligence) OR 12th (Science) with 1.5 years relevant experience OR Previous relevant Qualification of NSQF Level 4 with 1.5 years relevant experience
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 years
Last Reviewed On	18.02.2025
Next Review Date	18.02.2028
NSQC Approval Date	18.02.2025
QP Version	1.0
Model Curriculum Creation Date	18.02.2025
Model Curriculum Valid Up to Date	18.02.2028
Model Curriculum Version	1.0
Minimum Duration of the Course	350 Hours
Maximum Duration of the Course	350 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.

- Project Planning and Execution
- Data Acquisition and Preparation
- Artificial Intelligence Solutions Development
- AI and Data Security Implementation
- Project Evaluation and Reporting

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
ELE/N1420: Introduction to Artificial Intelligence	**30:00**	**00:00**	**00:00**	**00:00**	**30:00**
Module 1: Fundamentals of AI Techniques and Tools	30:00	00:00	00:00	00:00	30:00
ELE/N1421: Advanced Mathematics and Exploratory Data Analysis for Artificial Intelligence	**90:00**	**00:00**	**00:00**	**00:00**	**90:00**
Module 2: Mathematics for Data Science	90:00	00:00	00:00	00:00	90:00
ELE/N1422: Machine Learning	**90:00**	**00:00**	**00:00**	**00:00**	**90:00**
Module 3: Fundamentals of Machine Learning	90:00	00:00	00:00	00:00	90:00
ELE/N1423: NLP, Neural Networks, Deep Learning, and AI Capstone	**60:00**	**80:00**	**00:00**	**00:00**	**140:00**
Module 4: Basics of NLP, Neural Networks, Deep Learning, and AI Capstone	60:00	80:00	00:00	00:00	140:00
Total Duration	**270:00**	**80:00**	**00:00**	**00:00**	**350:00**

Module Details

Module 1: Fundamentals of AI Techniques and Tools

Mapped to ELE/N1420

Terminal Outcomes:

- Explain the core concepts and applications of AI in various industries.
- Analyze ethical issues and considerations related to AI technologies.
- Utilize AI tools like TensorFlow and Python to implement basic AI solutions effectively.

Duration: *30:00*	**Duration**: *00:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Understand the historical development and evolution of artificial intelligence. • Describe the fundamental components of AI, including machine learning and neural networks. • Identify real-world applications of AI in healthcare, finance, and other sectors. • Discuss ethical dilemmas such as bias, privacy, and transparency in AI systems. • Explore emerging trends and future prospects of AI technologies. • Evaluate the societal impact of AI advancements and ethical frameworks for regulation.	• Implement basic AI algorithms using TensorFlow and Python programming languages. • Develop simple machine learning models for data analysis and prediction tasks. • Perform data preprocessing and feature engineering for AI model optimization. • Evaluate AI model performance using metrics and visualization techniques. • Deploy and integrate AI solutions into practical applications or simulations.
Classroom Aids:	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
• Required: Computer with TensorFlow and Python installed.	

Module 2: Mathematics for Data Science

Mapped to ELE/N1421

Terminal Outcomes:

- Apply mathematical concepts to solve data science problems effectively.
- Utilize statistical methods for data analysis and inference.
- Implement mathematical and statistical techniques in machine learning and AI applications.

Duration: *90:00*	**Duration**: *00:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Understand foundational principles of algebra, calculus, and linear algebra relevant to data science. • Explain probability theory and its role in modeling uncertainty and decision-making processes. • Analyze statistical methods including hypothesis testing, regression analysis, and ANOVA. • Interpret data distributions, central tendency measures, and variability metrics. • Apply matrix operations and eigenvalue decomposition in data transformation and analysis. • Understand the principles and importance of exploratory data analysis (EDA) in data science. • Explain the role of probability theory in modeling uncertainty and decision-making. • Describe statistical methods for summarizing data and making inferences. • Interpret data distributions, central tendency measures, and variability metrics. • Analyze relationships between variables using correlation and regression analysis. • Explore techniques for data	• Implement mathematical operations and algorithms using Python libraries like NumPy and SciPy. • Perform data normalization, standardization, and transformation for machine learning models. • Apply statistical methods to analyze and interpret real-world datasets. • Use software tools like Jupyter Notebooks for interactive data analysis and visualization. • Develop and validate predictive models using statistical and machine learning techniques. • Perform data cleaning, transformation, and normalization using Pandas and NumPy. • Create visualizations to explore and communicate insights from data using Matplotlib and Seaborn. • Apply statistical methods like hypothesis testing and ANOVA to analyze data. • Develop proficiency in using Python for data manipulation and exploratory analysis. • Use Jupyter Notebooks for interactive data analysis and documentation of findings.

preprocessing and feature engineering in predictive modeling.	
Classroom Aids:	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
• **Required:** Computer with Python, NumPy, and SciPy installed. • **Optional:** Statistical software packages like R or SAS for advanced analytics.	

Module 3: Fundamentals of Machine Learning

Mapped to ELE/N1422

Terminal Outcomes:

- Develop and apply supervised learning models for various predictive tasks.
- Understand and implement decision trees and ensemble methods.
- Evaluate and optimize machine learning models using appropriate metrics and techniques.

Duration: *90:00*	**Duration:** *00:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Understand the fundamental concepts of supervised learning and its applications. • Explain the machine learning pipeline, including data preprocessing, feature selection, and model evaluation. • Describe various regression models and their use in numerical prediction. • Discuss classification models and their application in categorical prediction tasks. • Understand the principles of decision trees and ensemble methods. • Explore performance metrics and techniques for evaluating and optimizing machine learning models. • Understand the concepts and applications of unsupervised learning algorithms. • Explain the principles of clustering techniques, including K-means and hierarchical clustering. • Describe dimensionality reduction methods like PCA and LDA and their applications. • Discuss advanced clustering techniques such as DBSCAN and Gaussian Mixture Models.	• Implement regression and classification models using Python libraries such as Scikit-learn. • Perform data preprocessing and feature engineering to prepare datasets for modeling. • Develop decision tree models and apply pruning techniques to improve generalization. • Implement ensemble methods like Random Forest and Gradient Boosting for enhanced model performance. • Evaluate model performance using metrics like accuracy, precision, recall, and F1 score. • Implement K-means and hierarchical clustering using Python libraries like Scikit-learn. • Apply dimensionality reduction techniques (PCA, LDA) to high-dimensional datasets. • Develop and evaluate advanced clustering models such as DBSCAN and Gaussian Mixture Models.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	

- **Required:** Computer with Python and Scikit-learn installed.
- **Optional:** Jupyter Notebooks for interactive coding and model development.

Module 4: Basics of NLP, Neural Networks, Deep Learning, and AI Capstone

Mapped to ELE/N1423

Terminal Outcomes:

- Develop and implement deep learning models using neural networks.
- Apply advanced deep learning techniques to various data types and problems.
- Execute an AI capstone project demonstrating learned concepts and skills

Duration: ***60:00***	**Duration**: ***80:00***
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Understand the structure and functioning of neural networks, including neurons, layers, and activation functions. • Explain the backpropagation algorithm and its role in training neural networks. • Explore advanced deep learning architectures such as CNNs and RNNs. • Discuss generative models like GANs and their applications in creating synthetic data. • Understand the use of autoencoders for unsupervised learning and data compression. • Explore best practices for developing, training, and optimizing deep learning models.	• Implement neural network models using deep learning frameworks like TensorFlow and Keras. • Develop CNNs for image recognition and processing tasks. • Implement RNNs for sequential data modeling, such as time series and text analysis. • Create and train GANs to generate synthetic images and understand their training process. **AI Capstone Project:** • Solve real-world AI problems by designing and deploying a complete AI solution. • Demonstrate end-to-end project workflows, from data preprocessing to model deployment.
Classroom Aids	
Training kit (Trainer guide, Presentations), White board, Marker, projector, laptop, flipchart.	
Tools, Equipment and Other Requirements	
• **Required:** Computer with TensorFlow, Keras, and Python installed. • **Optional:** GPU for accelerated deep learning model training.	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
BE/B.Tech	Electrical/ Electronics/Computer science	1	Artificial Intelligence field	1	Training	
Diploma/ITI	Electrical/ Electronics/Computer science	2	Artificial Intelligence field	1	Training	
Certified in relevant CITS Trade						

Trainer Certification	
Domain Certification	**Platform Certification**
"AI Embedded Product Developer (Electronics), ELE/Q1407, version 1.0". Minimum accepted score is 80%.	Recommended that the Trainer is certified for the **AI Embedded Product Developer (Electronics), ELE/Q1407** "Trainer (VET and Skills)", mapped to the Qualification Pack: "MEP/Q2601, V2.0", with minimum score of 80%

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
BE/B.Tech	Electrical/ Electronics/Computer science	2	Artificial Intelligence field	1	Training	
Diploma/ITI	Electrical/ Electronics/Computer science	3	Artificial Intelligence field	2	Training	
Certified in relevant CITS Trade						

Assessor Certification	
Domain Certification	**Platform Certification**
"AI Embedded Product Developer (Electronics), ELE/Q1407, version 1.0". Minimum accepted score is 80%.	Recommended that the Assessor is certified forthe **AI Embedded Product Developer (Electronics), ELE/Q1407** "Assessor (VET and Skills)", mapped to the Qualification Pack: "MEP/Q2701, V2.0", with minimum score of 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 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 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

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.

Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.
Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.

Acronyms and Abbreviations

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
IPR	Intellectual Property Rights