



Model Curriculum

Artificial Intelligence Application Developer

QP Code: NIE/ITS/Q15003

Version: 1.0

NSQF Level: 4.5

Training Parameters

Sector	ITeS		
Sub-Sector	Artificial Intelligence		
Occupation	AI Development		
Country	India		
NSQF Level	4.5		
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2511.0106(Support Engineer)		
Minimum Educational Qualification and Experience	S. No.	Academic/Skill Qualification (with Specialization - if applicable)	Required Experience (with Specialization - if applicable)
	1.	<ul style="list-style-type: none"> • Completed 1st year of UG • Pursuing 1st year of UG and continuous education • Pursuing 3rd year of 3-year diploma after 10th and continuous education • Completed 3-year diploma after 10 	NA
	2.	<ul style="list-style-type: none"> • Completed 2nd year of 2-year diploma after 12th • Pursuing 2nd year of 2- year diploma after 12 and continuous education 	NA
	3.	Previous relevant Qualification of NSQF Level 4 and with minimum education as 8 th Grade pass	1.5 year relevant experience
Pre-Requisite License or Training	-		
Minimum Job Entry Age	No Bar		
Last Reviewed On	29.03.2023		
Next Review Date	29.03.2026		
NSQC Approval Date	29.03.2023		
QP Version	1.0		
Model Curriculum Creation Date	29.03.2023		
Model Curriculum Valid Up to Date	29.03.2026		
Model Curriculum Version	1.0		
Duration of the Course	540 Hours		

Program Overview

This section summarises the end objectives of the program along with its duration

Training Outcomes of the course:

Students will be able to understand the following concepts

- Students will be able to learn to install and configure the python IDE and learn about working on collaborative cloud interface required for programming
- Students will learn about the concept of Data Science that relies on mathematical and statistical formulas to extract data and make sense of it.
- Students will learn about unstructured and raw data and how to convert that into meaningful form.
- Student will be able to recognize Python Library Pandas which is the most widely used for Data Analysis/Data Science in machine learning tasks.
- Students will learn the concept of Machine Learning and its various categories and its application.
- Students will be able to make predictions about future events by applying various Regression algorithms and Classification algorithms.
- Students will learn the concept of Artificial Neural Networks and Deep Learning, their inter-connected structure of layers and the architecture.

Compulsory Modules

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

NOS/Module Name	Theory	Practical	Total
NOS 1: Programming with Python NOS Code: NIE/ITS/N14015 NSQF Level-4.5	20	40	60
NOS 2: Conceptualizing Data Science with Python NOS Code: NIE/ITS/N14016 NSQF Level-4.5	24	36	60
NOS 3: Data analysis and Visualization NOS Code: NIE/ITS/N14017 NSQF Level-4.5	34	56	90
NOS 4: Fundamentals of Machine Learning NOS Code: NIE/ITS/N14018 NSQF Level-4.5	12	18	30
NOS 5: Performance and Accuracy of Machine Learning models NOS Code: NIE/ITS/N14019 NSQF Level-4.5	35	55	90
NOS 6: Fundamentals of Deep Learning NOS Code: NIE/ITS/N14020 NSQF Level-4.5	25	35	60
Employability Skills NOS Code: DGT/VSQ/N0102 NSQF Level-4.5	-	-	60
OJT/Project NOS Code: N/A NSQF Level-4.5	-	-	90
Total	150	240	540

Module Details

Module 1/ (NOS1): Programming with Python

NOS Code: NIE/ITS/N14015

Terminal Outcomes:

After completion of the module, the students shall be able to understand:

- Students will be able to learn to install and configure the python IDE and learn about working on collaborative cloud interface required for programming
- Students will understand the basics of Python Language and will be able to recognize Python syntax
- Students will understand and write programs in python language, compile, debug and handle exceptions
- Student will have an understanding of working with top down or bottom up approach by making functions.
- Students will come to know about benefits of modular programming by defining and calling various functions.
- Students will be able to explain various ways of passing the parameters to functions and difference between all the ways.
- Students will learn the working of different data structures which allow to organize and store data.

Key Learning Outcomes:

Duration: 20 hours	Duration: 40 hours
Theory	Practical
Understand the steps to install and configure Python on different operating systems.	Set up a Python programming environment, including IDEs such as PyCharm or VS Code.
Comprehend the fundamental building blocks of Python, including data types, operators, and their use in programming.	Write and execute Python programs using fundamental constructs like data types, operators, and control flow statements.
Gain theoretical knowledge of Python's built-in data structures such as lists, tuples, sets, and dictionaries.	Develop hands-on expertise in list comprehension, dictionary comprehension, and advanced slicing techniques.
Understand the purpose and structure of Python packages and how to manage dependencies using tools like pip.	Develop a small project using multiple modules and packages to solidify understanding of modular programming.
Classroom Aid	
LCD Projector, White Board, Laptop, Internet with WiFi	
Tools, Equipment and Other Requirements	
NumPy, Pandas, Matplotlib, Seaborn, Scikit-Learn, tensorflow, Keras, PyTorch	

NOS 2: Conceptualising Data Science with python.

NOS Code: NIE/ITS/N14016

Terminal Outcomes:

After completion of the module, the students shall be able to:

- Students will learn about the concept of Data Science that relies on mathematical and statistical formulas to extract data and make sense of it.
- Students will learn about unstructured and raw data and how to convert that into meaningful form.
- Students will learn about how data can be converted into assets to help improve revenue by improving customer experience, and more.
- Students will learn about various tools used for processing volumes of data.
- Students will learn about techniques to pre-process the data to make it ready for analysis.
- Students will learn about the library which deals with n-dimensional arrays.
- Students will work on the library to perform a wide variety of mathematical operations on arrays.

Key Learning Outcomes:

Duration: 24 hours	Duration: 36 hours
Theory	Practical
Gain knowledge of the tools and libraries commonly used in data science, such as Python, NumPy, Pandas, and Matplotlib.	Set up a data science environment using tools like Jupyter Notebook, Anaconda, or VS Code.
Comprehend the significance of data pre-processing in improving the quality and usability of data.	Clean and preprocess datasets by handling missing values, duplicates, and inconsistent data formats.
Understand NumPy's role in efficient numerical computations and its array manipulation capabilities.	Create, reshape, and manipulate N-D arrays using numpy functions. Perform arithmetic and logical operations on arrays.
Understand statistical operations and their application in data analysis.	Implement statistical operations like mean, median, standard deviation, and variance on datasets.
Classroom Aid	
LCD Projector, White Board, Laptop, Internet with WiFi	
Tools, Equipment and Other Requirements	
NumPy, Pandas, Matplotlib, Seaborn, Scikit-Learn, tensorflow, Keras, PyTorch	

NOS 3: Data analysis and Visualization

NOS Code: NIE/ITS/N14017

Terminal Outcomes:

After completion of the module, the students shall be able to:

- Student will be able to distinguish the differences between Numpy and Pandas.
- Students will be able to analyse Big Data and make conclusions based on statistical theories.
- Students will learn to represent data in way that will facilitate better results for data science projects.
- Students will learn to use Pandas for cleaning messy datasets, and make them readable and relevant through huge set of commands and features.
- Students will learn to filter, segment, merge and segregate the datasets.
- Students will be able to demonstrate the role of Pre-processing, Analysis and Data science through guided case study and exercise
- Student will learn how business problems can be understood by using Visualisation techniques.

Key Learning Outcomes:

Duration: 34 hours	Duration: 56 hours
Theory	Practical
Understand the role of Pandas in data analysis and its significance in handling structured data.	Perform basic operations like loading, saving, and inspecting datasets using Pandas. Apply fundamental Pandas methods to understand the structure and properties of datasets.
Comprehend the concepts of Pandas Series and DataFrames as essential data structures.	Create Pandas Series and DataFrames from various data sources (e.g., CSV, Excel, and dictionaries).
Learn the essential steps of EDA, including summarizing datasets, handling missing data, and identifying correlations.	Generate descriptive statistics and summary metrics (mean, median, variance, etc.) for datasets.
Gain knowledge of various techniques for analyzing datasets to derive actionable insights.	Develop dashboards that integrate multiple visualizations to present comprehensive data insights.
Classroom Aid	
LCD Projector, White Board, Laptop, Internet with WiFi	
Tools, Equipment and Other Requirements	
NumPy, Pandas, Matplotlib, Seaborn, Scikit-Learn, tensorflow, Keras, PyTorch	

NOS 4: Fundamentals of Machine Learning

NOS Code: NIE/ITS/N14018

Terminal Outcomes:

After completion of the module, the students shall be able to:

- Students will learn the concept of Machine Learning and its various categories and its application.
- Students will be able to understand the difference between Supervised, unsupervised, and reinforcement learning
- Students will be able to understand different paths of Machine Learning, i.e., Computer Vision, Predictive Analysis, Natural Language Processing and other applications.
- Student will be able to implement ML models using various Classification and Regression algorithms.
- Students will be able to understand the complete cycle of AI Project.
- Student will be applying models using various algorithms in Scikit-learn library.

Key Learning Outcomes:

Duration: 12 hours	Duration: 18 hours
Theory	Practical
Understand the definition, scope, and applications of machine learning in various industries.	Set up a Python environment for machine learning using libraries like Scikit-learn, NumPy, and Pandas.
Gain insights into supervised learning, unsupervised learning, and reinforcement learning methodologies.	Implement supervised learning models such as linear regression, logistic regression, and decision trees.
Grasp the stages of the machine learning pipeline: data preprocessing, feature selection, model building, evaluation, and deployment.	Evaluate model performance using metrics like accuracy, precision, recall, F1 score, and confusion matrix.
Understand key evaluation metrics, such as accuracy, precision, recall, F1 score, and mean squared error.	Develop end-to-end pipelines for building and deploying machine learning models.
Classroom Aid	
LCD Projector, White Board, Laptop, Internet with WiFi	
Tools, Equipment and Other Requirements	
NumPy, Pandas, Matplotlib, Seaborn, Scikit-Learn, tensorflow, Keras, PyTorch	

NOS 5: Performance and Accuracy of Machine Learning models.

NOS Code: NIE/ITS/N14019

Terminal Outcomes:

After completion of the module, the students shall be able to:

- Students will be able to make predictions about future events by applying various Regression algorithms and Classification algorithms.
- Students will learn to apply ML models to analyse historical data with the goal of identifying trends or patterns and then using those insights to predict future outcomes.
- Students will apply various statistics techniques like Correlation, hypothesis, Normal Distribution etc to build a good predictive model.
- Students will learn to measure predictive validity by applying various metrics of classification and regression.
- Students will enhance predictive models by using Feature Selection, highlighting patterns and bringing domain expertise.
- Students will learn how good metrics measure progress and bring improvement with respect to the business problem.

Key Learning Outcomes:

Duration: 35 hours	Duration: 55 hours
Theory	Practical
Understand the concepts of predictive analysis and its significance in machine learning.	Apply regression techniques (e.g., Linear Regression, Logistic Regression) to real-world datasets for predictive analysis.
Gain insights into statistical methods such as mean, median, mode, variance, standard deviation, and correlation.	Perform statistical analysis on datasets to extract meaningful insights and identify patterns.
Understand the role of feature selection, feature scaling, and data transformation in improving model performance.	Calculate and interpret evaluation metrics such as accuracy, precision, recall, and F1 score for machine learning models.
Learn to identify the appropriate ML algorithms based on problem statements and data characteristics.	Build and execute an end-to-end predictive analysis project using machine learning libraries (e.g., Scikit-learn, TensorFlow, or PyTorch).
Classroom Aid	
LCD Projector, White Board, Laptop, Internet with WiFi	
Tools, Equipment and Other Requirements	
NumPy, Pandas, Matplotlib, Seaborn, Scikit-Learn, tensorflow, Keras, PyTorch	

NOS 6: Fundamentals of Deep Learning

NOS Code: NIE/ITS/N14020

Terminal Outcomes:

After completion of the module, the students shall be able to:

- Students will learn the concept of Artificial Neural Networks and Deep Learning, their inter-connected structure of layers and the architecture.
- Students will learn how ANN can model complex function consisting of several processing elements that work on predefined activation functions.
- Students will learn the concept of Convolutional Neural Network, its architecture, concept of filters, pooling and activation functions.
- Students will learn and apply CNN model for image recognition and tasks that involve the processing of pixel data.
- Students will implement projects on non-linear and complex relationships on problems of Classification using CNN.

Key Learning Outcomes:

Duration: 25 hours	Duration: 35 hours
Theory	Practical
Students will gain knowledge about the architecture and functioning of Convolutional Neural Networks (CNNs), including concepts like convolutional layers, pooling layers, and fully connected layers.	Able to design, implement, and train deep learning models using frameworks such as TensorFlow or PyTorch. This includes creating feedforward neural networks and applying backpropagation techniques.
Students will be able to describe various applications of CNNs in computer vision tasks such as image classification, object detection, and image segmentation.	Implement Convolutional Neural Networks (CNNs) from scratch or using high-level APIs like Keras.
Students will understand key concepts in Natural Language Processing (NLP), including tokenization, stemming, lemmatization, and vectorization techniques (e.g., word embeddings).	Develop practical skills in implementing object detection algorithms (e.g., YOLO, SSD) and image segmentation techniques (e.g., U-Net), applying these methods to real-world datasets.
Students will develop the ability to evaluate the performance of NLP models using appropriate metrics like BLEU score for translation tasks or accuracy for classification tasks.	Implement key NLP algorithms such as tokenization, stemming, lemmatization, and vectorization techniques (e.g., TF-IDF, word embeddings) using libraries like NLTK or spaCy.
Classroom Aid	
LCD Projector, White Board, Laptop, Internet with WiFi	
Tools, Equipment and Other Requirements	
NumPy, Pandas, Matplotlib, Seaborn, Scikit-Learn, tensorflow, Keras, PyTorch	

Module 7: Employability Skills

NOS Code: DGT/VSQ/N0102

Terminal Outcomes:

After completing this program, participants will be able to:

- Outline the importance of Employability Skills for the current job market and future of work.
- List different learning and employability-related GOI and private portals and their usage.
- Research and prepare a note on different industries, trends, required skills, and the available opportunities.

Key Learning Outcomes

Duration: 60 Hrs.

Key Learning Outcomes

Constitutional Values – Citizenship

- Explain constitutional values, including civic rights and duties, citizenship, responsibility towards society, and personal values and ethics such as honesty, integrity, caring, and respecting others that are required to become a responsible citizen.
- Demonstrate how to practice different environmentally sustainable practices.

Becoming a Professional in the 21st Century

- Discuss relevant 21st-century skills required for employment.
- Highlight the importance of practicing 21st-century skills like Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn, etc., in personal or professional life.
- Create a pathway for adopting a continuous learning mindset for personal and professional development.

Basic English Skills

- Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone.
- Read and understand text written in basic English.
- Write a short note/paragraph/letter/e-mail using correct basic English.

Career Development & Goal Setting

- Create a career development plan.
- Identify well-defined short- and long-term goals.

Communication Skills

- Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette.
- Write a brief note/paragraph on a familiar topic.
- Explain the importance of communication etiquette, including active listening for effective communication.

- Role-play a situation on how to work collaboratively with others in a team.

Diversity and Inclusion

- Demonstrate how to behave, communicate, and conduct appropriately with all genders and PwD.
- Discuss the significance of escalating sexual harassment issues as per the POSH act.

Financial and Legal Literacy

- Discuss various financial institutions, products, and services.
- Demonstrate how to conduct offline and online financial transactions safely and securely and check passbook/statement.
- Explain the common components of salary such as Basic, PF, Allowances (HRA, TA, DA, etc.), tax deductions.
- Calculate income and expenditure for budgeting.
- Discuss legal rights, laws, and aids.

Essential Digital Skills

- Describe the role of digital technology in day-to-day life and the workplace.
- Demonstrate how to operate digital devices and use the associated applications and features safely and securely.
- Demonstrate how to connect devices securely to the internet using different means.
- Follow the dos and don'ts of cybersecurity to protect against cybercrimes.
- Discuss the significance of displaying responsible online behavior while using various social media platforms.
- Create an email id and follow email etiquette to exchange emails.
- Show how to create documents, spreadsheets, and presentations using appropriate applications.
- Utilize virtual collaboration tools to work effectively.

Entrepreneurship

- Explain the types of entrepreneurship and enterprises.
- Discuss how to identify opportunities for potential business, sources of funding, and associated financial and legal risks with its mitigation plan.
- Describe the 4Ps of Marketing-Product, Price, Place, and Promotion and apply them as per requirement.
- Create a sample business plan for the selected business opportunity.

Customer Service

- Classify different types of customers.
- Demonstrate how to identify customer needs and respond to them in a professional manner.
- Discuss various tools used to collect customer feedback.
- Discuss the significance of maintaining hygiene and dressing appropriately.

Getting ready for Apprenticeship & Jobs

- Draft a professional Curriculum Vitae (CV).
- Use various offline and online job search sources to find and apply for jobs.
- Discuss the significance of maintaining hygiene and dressing appropriately for an interview.

- Role-play a mock interview.
- List the steps for searching and registering for apprenticeship opportunities.

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training/Assessment Experience		Remarks
		Years	Specialization	Years	Specialization	
O-Level (IT) / BCA / Bsc(IT/CS) / Diploma in CS/IT/ allied area	IT/Computer Science/EC/EE allied branches	2	-	-	-	-

Trainer Certification

Domain Certification	Platform Certification
Certified to TOT for the job role: NIE/ITS/Q15003 “Artificial Intelligence Application Developer” or equivalent as per NCrF. Minimum accepted score is 80%	Recommended that the Trainer is certified for the Job Role: “Trainer (VET and skills)”, mapped to the Qualification Pack: “MEP/Q2601, v2.0” or equivalent as per NCrF. Minimum accepted score is 80%

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training/Assessment Experience		Remarks
		Years	Specialization	Years	Specialization	
B-LEVEL / MCA/ B.Tech in CS/IT/EC/EE/ allied areas	IT/Computer Science/EC/EE allied branches	4	-	-	-	-

Assessor Certification*	
Domain Certification	Platform Certification
Certified to TOA for the job role: NIE/ITS/Q15003 “Artificial Intelligence Application Developer” or equivalent as per NCrF. Minimum accepted score is 80%	Recommended that the assessor is certified for the Job Role: “Trainer (VET and skills)”, mapped to the Qualification Pack: “MEP/Q2701, v2.0” or equivalent as per NCrF. Minimum accepted score is 80%

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), Practical assessment, internal assessment, Project/Presentation/ Assignment, Major Project. The emphasis is on the practical demonstration of skills & knowledge gained by the candidate through the training. Each OUTCOME is assessed & marked separately. A candidate is required to pass all OUTCOMES individually based on the passing criteria.

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 the roll number.
3. The assessor carries out theory online assessments through remote proctoring methodology. Theory examination would be conducted online and the paper comprise of MCQ. Conduct of assessment are through trained proctors. Once the test begins, remote proctors have full access to 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.
4. An External Examiner/ Observer may be deployed including NIELIT officials for evaluation of Practical examination/ internal assessment / Project/ Presentation/. Major Project (if applicable) would be evaluated preferably by external/ subject expert including NIELIT officials.
5. Pass percentage would be 50% marks in each component.
6. Candidates may apply for re-examination within the validity of registration (only in the assessment component in which the candidate failed).
7. For re-examination prescribed examination fee is required to be paid by the candidate only for the assessment component in which the candidate wants to reappear.
8. There would be no exemption for any paper/module for candidates having similar qualifications or skills.
9. The examination will be conducted in English language only

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 (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the 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

Term	Description
QP	Qualification Pack
NSQF	National Skills Qualification Framework
NSQC	National Skills Qualification Committee
NOS	National Occupational Standards