COMPETENCY STANDARD
for
AI in Immersive Technology

Level: 06

(ICT Sector)

Competency Standard Code: CS-ICT-AIIT-L6-EN-V1

National Skills Development Authority
Prime Minister's Office
Government of the People's Republic of Bangladesh

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This Competency Standard for AI in Immersive Technology, Level 6 is a document for the development of curricula, teaching and learning materials, and assessment tools. It also serves as the document for providing training consistent with the requirements of industry in order to meet the qualification of individuals who graduated through the established standard via competency-based assessment for a relevant job.

This document has been developed by NSDA in association with ICT Sector ISC, industry representatives, academia, related specialist, trainer and related employee.

Public and private institutions may use the information contained in this standard for activities benefitting Bangladesh.

Introduction

The NSDA aims to enhance an individual's employability by certifying completeness with skills. NSDA works to expand the skilling capacity of identified public and private training providers qualitatively and quantitatively. It also aims to establish and operationalize a responsive skills ecosystem and delivery mechanism through a combination of well-defined set of mechanisms and necessary technical supports.

Key priority economic growth sectors identified by the government have been targeted by NSDA to improve current job skills along with existing workforce to ensure required skills to industry standards. Training providers are encouraged and supported to work with industry to address identified skills and knowledge to enable industry growth and increased employment through the provision of market responsive inclusive skills training program. "AI in Immersive Technology", Level 6 is selected as one of the priority occupations of ICT Sector. This standard is developed to adopt a demand driven approach to training with effective inputs from Industry Skills Councils (ISC's), employer associations and employers.

Generally, a competency standard informs curriculum, learning materials, assessment and certification of trainees enrolled in Skills Training. Trainees who successfully pass the assessment will receive a qualification in the National Skills Qualification Framework (BNQF) under Bangladesh National Qualification Framework (BNQF) and will be listed on the NSDA's online portal.

This competency standard is developed to improve skills and knowledge in accordance with the job roles, duties and tasks of the occupation and ensure that the required skills and knowledge are aligned to industry requirements. A series of stakeholder consultations, workshops were held to develop this document.

The document also details the format, sequencing, wording and layout of the Competency Standard for an occupation which is comprised of Units of Competence and its corresponding Elements.

Overview
A competency standard is a written specification of the knowledge, skills and attitudes required for the performance of an occupation, trade or job corresponding to the industry standard of performance required in the workplace.

The purpose of a competency standards is to:

- provide a consistent and reliable set of components for training, recognising and assessing people's skills, and may also have optional support materials
- enable industry recognised qualifications to be awarded through direct assessment of workplace competencies
- encourage the development and delivery of flexible training which suits individual and industry requirements
- encourage learning and assessment in a work-related environment which leads to verifiable workplace outcomes

Competency standards are developed by a working group comprised of representative from NSDA, Key Institutions, ISC, and industry experts to identify the competencies required of an occupation in Informal Sector.

Competency standards describe the skills, knowledge and attitude needed to perform effectively in the workplace. CS acknowledge that people can achieve technical and vocational competency in many ways by emphasizing what the learner can do, not how or where they learned to do it.

With competency standards, training and assessment may be conducted at the workplace or at training institute or any combination of these.

Competency standards consist of a number of units of competency. A unit of competency describes a distinct work activity that would normally be undertaken by one person in accordance with industry standards.

Units of competency are documented in a standard format that comprises of:

- unit title
- nominal duration
- unit code
- unit descriptor
- elements and performance criteria
- variables and range statement
- curricular content guide
- assessment evidence guides

Together, all the parts of a unit of competency:

- describe a work activity
- guide the assessor to determine whether the candidate is competent or not yet competent

The ensuing sections of this document comprise of a description of the relevant occupation, trade or job with all the key components of a unit of competency, including:

- a chart with an overview of all Units of Competency for the relevant occupation, trade or job including the Unit Codes and the Unit of Competency titles and corresponding Elements
- the Competency Standard that includes the Unit of Competency, Unit Descriptor, Elements and Performance Criteria, Range of Variables, Curricular Content Guide and Assessment Evidence Guide.

Level Descriptors of BNQF

Level & Job Classification	Knowledge Domain	Skills Domain	Responsibility Domain
6-Mid-Level Manager/ Sub Assistant Engineer	Comprehensive actual and theoretical knowledge within a specific work or study area with an awareness of the validity and limits of that knowledge, able to analyse, compare, relate and evaluate.	Specialised and wider range of cognitive and practical skills required to provide leadership in the development of creative solutions to defined problems. Communicate professional issues and solutions to the team and to external partners/users.	Work under broad guidance and self-motivation to execute strategic and operational plan/s. Lead lower-level management. Diagnose and resolve problems within and among work groups.
5-Supervisor	Broad knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to scrutinize and break information into parts by identifying motives or causes.	Broad range of cognitive and practical skills required to generate solutions to specific problems in one or more work or study areas. Communicate practice-related problems and possible solutions to external partners.	Work under guidance of management and self-direction to resolve specific issues. Lead and take responsibility for the work and actions of group/team members. Bridge between management.
4-Highly Skilled Worker	Broader knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to solve problems to new situations by comparing and applying acquired knowledge.	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying the full range of methods, tools, materials and information. Communicate using technical terminology and IT technology with partners and users as per workplace requirements.	Work under minimal supervision in specific contexts in response to workplace requirements. Resolve technical issues in response to workplace requirements and lead/guide a team/ group.
3-Skilled Worker	Moderately broad knowledge in a specific work or study area, able to perceive ideas and abstract from drawing and design according to workplace requirements.	Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools. Communicate with his team and limited external partners upholding the values, nature and culture of the workplace	Work or study under supervision with considerable autonomy. Participate in teams and responsible for group coordination.
2-Semi Skilled Worker	Basic understanding of underpinning knowledge in a specific work or study area, able to interpret and apply common occupational terms and instructions.	Skills required to carry out simple tasks, communicate with his team in the workplace presenting and discussing results of his work with required clarity.	Work or study under supervision in a structured context with limited scope of manipulation
1 –Basic Skilled Worker	Elementary understanding of ability to interpret the underpinning knowledge in a specific study area, able to interpret common occupational terms and instructions.	Specific Basic skills required to carry out simple tasks. Interpret occupational terms and present the results of own work within guided work environment/ under supervision.	Work under direct supervision in a structured context with limited range of responsibilities.

List of Abbreviations

General	
NSDA	National Skills Development Authority
BMET	Bureau of Manpower Employment and Training
ILO	International Labor Organization
ISC	Industry Skills Council
NPVC	National Pre-Vocation Certificate
BNQF	National Skills Qualifications Framework
PPP	Public Private Partnership
SCVC	Standards and Curriculum Validation Committee
STP	Skills Training Provider
UoC	Unit of Competency
Occupation Specific	
ROC Curve	receiver operating characteristic curve
ReLU	Rectified Linear Unit
I/O	Input/Output
AI	Artificial Intelligence
ML	Machine Learning
NLP	Natural Language Processing
KNN	K-Nearest Neighbour
PCA	Principal Component Analysis
SVD	Singular Value Decomposition
ICA	Independent Component Analysis
TF-IDF	Term Frequency - Inverse Document Frequency
BoW	Bag of Words
ANN	Artificial neural network
CNN	Convolutional Neural Network
DL	Deep Learning
VGG	Visual Geometry Group
RNN	Recurrent Neural Network
GRU	Gated Recurrent Units
LSTM	Long Short-Term Memory
AR	Augmented reality
VR	Virtual Reality
MR	Mixed Reality
XR	extended reality
HMD	Head mounted display
DOTS	Data oriented technology stack

Approved in

28th Authority Meeting of NSDA

Held on 07.09.2023

Contents

Competency Standards for National Skill Certificate – 6 in
AI in Immersive Technology in ICT Sector

Course Structure

SL	Unit Code and Title		UoC Level	Nominal Duration (Hours)
Generic Units of Competencies				**60**
1.	GU030L3V1	Apply Communicative English for Employability	6	60
Occupation Specific Units of Competencies				**260**
2.	OU-ICT-AIIT-01-L6-V1	Apply Math Skills for Machine Learning	6	20
3.	OU-ICT-AIIT-02-L6-V1	Develop programs using Python	6	20
4.	OU-ICT-AIIT-03-L6-V1	Create Projects on Artificial Intelligence (AI) and Machine Learning (ML)	6	60
5.	OU-ICT-AIIT-04-L6-V1	Implement of Deep Learning	6	60
6.	OU-ICT-AIIT-05-L6-V1	Work with Immersive Technology	6	100
Total Nominal Learning Hours				320

Units & Elements at Glance

Generic Units of Competencies

Code	Unit of Competency	Elements of Competency	Duration (Hours)
GU030L6V1	Apply Communicative English for Employability	1. Exercise workplace communication and etiquette 2. Work with Workplace Documents 3. Participate in workplace meetings and discussions 4. Exercise professional ethics at workplace	60

Occupation Specific Units of Competencies

Code	Unit of Competency	Elements of Competency	Duration (Hours)
OU-ICT-AIIT-01-L6-V1	Apply Math Skills for Machine Learning	1. Apply Statistical measures 2. Use Multivariable Calculus 3. Apply Linear Algebra 4. Use Optimization Methods	20
OU-ICT-AIIT-02-L6-V1	Develop programs using Python	1. Work with Python basics 2. Apply input and output methods in python 3. Solve problems associated with "loops" 4. Implement string functions 5. Implement basic I/O functions 6. Perform data analysis using Python	20
OU-ICT-AIIT-03-L6-V1	Create Projects on Artificial Intelligence (AI) and Machine Learning (ML)	1. Work with AI 2. Work with Machine Learning (ML) 3. Solve problems with regression 4. Work with advanced features 5. Work with projects of ML	70
OU-ICT-AIIT-04-L6-V1	Implement of Deep Learning	1. Work with Deep Learning (DL) 2. Analyze of features 3. Implement DL features 4. Perform project development activities	70
OU-ICT-AIIT-05-L6-V1	Work with Immersive Technology	1. Comprehend basics of immersive technologies 2. Comprehend emergence of XR in the workplace	80

		3. Work with Camera tracking and 3D Rendering for Immersive Environment 4. Develop 3D Games and applications 5. Create Mixed Reality (MR) Applications	

Generic Units of Competencies

Unit Code and Title	GU30L6V1: Apply Communicative English for Employability
Nominal Hours	**60 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to carry out workplace interaction. It specifically includes – interpreting workplace communication and etiquette; reading and understand workplace documents; participating in workplace meetings and discussions; and practicing professional ethics at workplace.
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables Training Components
1. Exercise workplace communication and etiquette	1.1 Workplace code of conducts are interpreted as per organizational guidelines 1.2 Appropriate lines of communication are maintained with supervisors and colleagues 1.3 Speaking English is exercised 1.4 Listening skills are applied 1.5 Workplace interactions are conducted in a **courteous manner** to gather and convey information 1.6 Questions about routine **workplace procedures and matters** are asked and responded as required
2. Work with Workplace Documents	2.1 Reading skills are applied for English documents 2.2 Workplace documents are interpreted as per standard 2.3 English writing skills are exercised 2.4 Assistance is taken to aid comprehension when required from peers / supervisors 2.5 Specific and relevant information are accessed from **appropriate sources** 2.6 Appropriate medium is used to transfer information and ideas
3. Participate in workplace meetings and discussions	3.1 Team meetings are attended on time and followed meeting procedures and etiquette 3.2 Own opinions are expressed and listened to those of others without interruption 3.3 Inputs are provided consistent with the meeting purpose and interpreted and implemented meeting outcomes 3.4 Meeting minutes is written as per standard procedure
4. Exercise professional ethics at workplace	4.1 Responsibilities as a team member are demonstrated and kept promises and commitments made to others 4.2 Tasks are performed in accordance with workplace procedures 4.3 Confidentiality is respected and maintained 4.4 Situations and actions considered inappropriate or which present a conflict of interest are avoided
Range of Variables	

Variable	**Range** (may include but not limited to):
1. Courteous Manner	1.1 Active listening 1.2 Effective questioning
2. Workplace Procedures and Matters	2.1 Notes 2.2 Agenda 2.3 Simple reports such as progress and incident reports 2.4 Job sheets 2.5 Operational manuals 2.6 Brochures and promotional material 2.7 Visual and graphic materials 2.8 Standards 2.9 OSH information 2.10 Signs
3. Appropriate Sources	3.1 HR Department 3.2 Managers 3.3 Supervisors
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency	
1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 followed workplace code of conducts is as per organizational guidelines 1.2 maintained workplace documents as per standard 1.3 followed workplace instructions and symbols 1.4 followed and implemented meeting outcomes
2. Underpinning Knowledge	2.1 Workplace communication and etiquette 2.2 Workplace documents, signs and symbols 2.3 meeting procedure and etiquette
3. Underpinning Skills	3.1 Interpreting performance of workplace communication and etiquette 3.2 Interpreting workplace instructions and symbol 3.3 Interpreting workplace code of conducts is as per organizational guidelines 3.4 Interpreting workplace documents as per standard 3.5 Interpreting and implementing meeting outcomes
4. Underpinning Attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace
5. Resource Implications	The following resources must be provided:

	5.1 Relevant tools, Equipment, software and facilities needed to perform the activities. 5.2 Required learning materials.
6. Methods of Assessment	Methods of assessment may include but not limited to: 6.1 Written Test 6.2 Demonstration 6.3 Oral Questioning 6.4 Portfolio
7. Context of Assessment	7.1 Competency assessment must be done in a NSDA accredited assessment centre 7.2 Assessment should be done by an NSDA certified/ nominated assessor

Accreditation Requirements

National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NTVQF qualification must accredit training Providers. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Occupation Specific Units of Competencies

Unit Code and Title	**OU-ICT-AIIT-01-L6-V1: Apply Math Skills for Machine Learning**
Unit Descriptor	This unit covers the knowledge, skills and attitude required to apply Math Skills for Machine. It specifically includes the requirements of applying statistical measures, using multivariable calculus, applying Linear Algebra, and using optimization methods.
Nominal Hours	**20 hours**
Elements of Competency	**Performance Criteria** **Bold and underlined** terms are elaborated in the range of variables
1. Apply Statistical measures	1.1 **Measures of central tendency** are exercised 1.2 **Random variable and probability distribution** are exercised 1.3 **Hypothesis Testing** is applied
2. Use Multivariable Calculus	2.1 Multi variable Functions are exercised 2.2 Derivatives and gradients are exercised 2.3 **Activation functions** are applied 2.4 Cost function is exercised 2.5 Plotting of functions are applied 2.6 Minimum and Maximum values of a function are determined
3. Apply Linear Algebra	3.1 **Matrices** are exercised 3.2 **Vectors** are exercised
4. Use Optimization Methods	4.1 Objective function is applied 4.2 Likelihood function is applied 4.3 Error function is applied 4.4 Gradient Descent Algorithm and its variants are applied
Range of Variables	
Variable	**Range** (May include but not limited to:)
1. Measures of central tendency	1.1 Mean 1.2 Median 1.3 Mode 1.4 Standard deviation/variance
2. Random variable and probability distribution	2.1 Correlation coefficient and the covariance matrix 2.2 Probability distributions (Binomial, Poisson, Normal) 2.3 p-value 2.4 Bayes' Theorem (Precision, Recall, Positive Predictive Value, Negative Predictive Value, Confusion Matrix, ROC Curve)
3. Hypothesis Testing	3.1 A/B Testing 3.2 Monte Carlo Simulation
4. Activation Function	4.1 Step function 4.2 Sigmoid function 4.3 Logit function 4.4 ReLU (Rectified Linear Unit) function
5. Matrices	5.1 Transpose of a matrix 5.2 The inverse of a matrix 5.3 The determinant of a matrix
6. Vectors	6.1 Dot product 6.2 Eigenvalues 6.3 Eigenvectors

Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the unit of competency.	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 Applied statistical measures 1.2 Used multivariable calculus 1.3 Applied linear algebra 1.4 Used optimization methods
2. Underpinning knowledge	2.1 Statistical measures 2.2 Measures of central tendency 2.3 Random variable and probability distribution 2.4 Hypothesis yesting 2.5 Multivariable calculus 2.6 Multivariable functions 2.7 Cost functions 2.8 Linear algebra 2.9 Matrices 2.10 Vectors 2.11 Optimization methods
3 Underpinning skill	3.1 Applying statistical measures 3.2 Using multivariable calculus 3.3 Applying linear algebra 3.4 Using optimization methods
4 Required attitude	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn the document preparation process. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for the rights of peers, subordinates and seniors at the workplace. 4.8 Communication with peers, subordinates and seniors in the workplace. 4.9 Keeps a clean and orderly workplace and equipment.
5 Resource implication	5.1 Relevant tools, Equipment, software and facilities needed to perform the activities. 5.2 Required learning materials.
6 Methods of assessment	6.1 Written test 6.2 Demonstration 6.3 Oral questioning
7 Context of assessment	7.1 Competency assessment must be done in NSDA accredited center. 7.2 Assessment should be done by NSDA certified/ nominated assessor
Accreditation Requirements Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

Unit Code and Title	**OU-ICT-AIIT-02-L6-V1: Develop programs using Python**
Unit Descriptor	This unit covers the knowledge, skills and attitude required to develop programs using python. It specifically includes the requirements of working with Python basics, applying input and output methods in python, solving problems associated with "loops", implementing string functions, basic I/O functions, and performing data analysis using Python.
Nominal Hours	**20 hours**
Elements of Competency	**Performance Criteria** **Bold and underlined** terms are elaborated in the range of variables
1. Work with Python basics	1.1 **Fundamentals of python** are interpreted 1.2 Python environment is set up 1.3 Data types and variables are used 1.4 Numeric values are used 1.5 String variables are used
2. Apply input and output methods in python	2.1 Printing with parameters is exercised 2.2 Getting inputs from users is exercised 2.3 String formatting is applied 2.4 Simple and complex decision making is applied using **logical statements**
3. Solve problems associated with "loops"	3.1 **Loops** are interpreted 3.2 Problems associated with loops are exercised 3.3 **Advanced data storage techniques** are applied in python
4. Implement string functions	4.1 String input methods are interpreted 4.2 String input methods are applied 4.3 Strings are manipulated 4.4 Built-in string functions are used
5. Implement basic I/O functions	5.1 Opening and closing files are exercised 5.2 Modes of accessing files are exercised 5.3 Create, update and delete of a file is exercised
6. Perform data analysis using Python	6.1 Types of data analysis is interpreted 6.2 Data analysis is exercised 6.3 Data visualization and explainability of data for decision making is exercised
Range of Variables	
Variable	**Range** (May include but not limited to:)
1. Fundamentals of python	1.1 Python programming 1.2 Coding system 1.3 Basic python code – "Hello World" 1.4 Code execution 1.5 Writing comments

	1.6 Data types 1.7 Variables
2. logical statements	2.1 The "if" statement 2.2 Logical operator 2.3 Complex expressions
3. Loops	3.1 "for" loop 3.2 "while" loop
4. Advanced data storage techniques	4.1 Indexing in list and dictionary 4.2 Create, update and delete list and dictionary elements 4.3 Basic operations on list and dictionary elements
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the unit of competency.	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 Applied simple and complex decision making using logical statements 1.2 Applied advanced data storage techniques in python 1.3 Used built-in string functions 1.4 Exercised data visualization and explainability of data for decision making
2. Underpinning knowledge	2.1 Python Environment and data types 2.2 Input and output methods 2.3 Control structure 2.4 String functions 2.5 Basic I/O functions 2.6 Data analysis 2.7 Loops
8 Underpinning skill	3.1 Work with Python basics 3.2 Apply input and output methods in python 3.3 Solve problems associated with "loops" 3.4 Implement string functions 3.5 Implement basic I/O functions 3.6 Perform data analysis using Python
9 Required attitude	4.10 Commitment to occupational safety and health. 4.11 Promptness in carrying out activities. 4.12 Sincere and honest to duties. 4.13 Eagerness to learn the document preparation process. 4.14 Tidiness and timeliness. 4.15 Environmental concerns. 4.16 Respect for the rights of peers, subordinates and seniors at the workplace. 4.17 Communication with peers, subordinates and seniors in the workplace. 4.18 Keeps a clean and orderly workplace and equipment.
10 Resource implication	5.3 Relevant tools, Equipment, software and facilities needed to perform the activities. 5.4 Required learning materials.

11 Methods of assessment	6.4 Written test 6.5 Demonstration 6.6 Oral questioning
12 Context of assessment	7.3 Competency assessment must be done in NSDA accredited center. 7.4 Assessment should be done by NSDA certified/ nominated assessor
Accreditation Requirements Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

Unit Code Title	**OU-ICT-AIIT-03-L6-V1: Create Projects on Artificial Intelligence (AI) and Machine Learning (ML)**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to create projects on Artificial Intelligence (AI) and Machine Learning (ML). This specifically includes the requirements of working with AI, working with Machine Learning (ML, solving problems with regression, working with advanced features, and working with projects of ML
Nominal Hours	**60 Hours**
Elements of Competencies	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables)
1. Work with AI	1.1 **Fundamentals of AI and Machine Learning** are interpreted 1.2 **Searches with AI** are explained and implemented 1.3 **Game AI** is interpreted and implemented 1.4 **Logic in AI** is comprehended
2. Work with Machine Learning (ML)	2.1 **Fundamentals of Machine Learning** are interpreted 2.2 ML applications are used 2.3 **Basic problems** in ML, AI & ML Tools, Libraries and software are exercised 2.4 **Activities with data** are implemented 2.5 **Branches of ML** are comprehended
3. Solve problems with regression	3.1 **Linear regression** is interpreted 3.2 Problems related to Linear regression are exercised 3.3 **Logistic regression** is interpreted 3.4 Problems related to Logistic regression are exercised
4. Work with advanced features	4.1 **Data preparation and feature extraction** are explained and implemented 4.2 **Support vector machines** are explained and implemented 4.3 **Overfitting and underfitting** are explained and implemented 4.4 Multinominal Naïve Bays, Stochastic Gradient Descent, Decision Tree and random forest are interpreted and implemented 4.5 **Unsupervised learning** is interpreted and implemented
5. Work with projects of ML	5.1 **Evaluating ML Models** is implemented 5.2 **ML Application in NLP** is exercised 5.3 **ML Applications in Computer Vision** is exercised 5.4 **ML based Project** development is implemented 5.5 **Considerations for AI-ML based system** are addressed
Range of Variables	
Variable	**Range** (may include but not limited to):
1. Fundamentals of AI and Machine Learning	1.1 Introduction of AI and ML 1.2 History of AI

	1.3 Weak and strong AI 1.4 AI and its applications 1.5 AI and ML current and future trends 1.6 Prospects of AI and ML
2. Searches with AI	2.1 Intelligent Agents 2.2 Uniformed Search 2.3 Informed search 2.4 Heuristic Search
3. Game AI	3.1 Mini-max & alpha-beta pruning 3.2 Constraint Satisfaction Problem
4. Logic in AI	4.1 Propositional & Predicate Logic 4.2 Planning 4.3 Basics of Natural Language Processing (NLP) 4.4 Frame Problem
5. Fundamentals of Machine Learning	5.1 Difference between AI and ML 5.2 ML applications 5.3 Importance of AI and ML on Industry 4.0
6. Basic Problems	6.1 Prediction problems 6.2 Classification problems 6.3 Clustering problems
7. Activities with data	7.1 Data processing, Cleaning and manipulation 7.2 Exploratory data analysis
8. Branches of ML	8.1 Unsupervised Learning 8.2 Supervised Learning 8.3 Reinforcement Learning
9. Linear regression	9.1 Gradient Descent 9.2 Loss computation 9.3 Evaluation Metrics
10. Logistic regression	10.1 Hypothesis representation 10.2 Cost function
11. Data preparation and feature extraction	11.1 Vectorization 11.2 Computing on data 11.3 Plotting on data
12. Support vector machines	12.1 Optimization 12.2 Large margin intuitions 12.3 Kernels
13. Overfitting and underfitting	13.1 Reducing network size 13.2 Adding weight regularization 13.3 Adding dropout
14. Unsupervised learning	14.1 K-means 14.2 KNN 14.3 PCA 14.4 SVD

	14.5 ICA
15. Evaluating ML Models	15.1 Training 15.2 Validation 15.3 Testing 15.4 Performance matrices 15.5 ML Tools and library packages
16. ML Application in NLP	16.1 Feature extraction (TF-IDF, BoW) 16.2 Model Development: Training, testing 16.3 Classification and prediction 16.4 Error analysis
17. ML Applications in Computer Vision	17.1 Visual feature extraction 17.2 Feature visualization 17.3 Model Interpretation 17.4 Model training and testing
18. ML based Project	18.1 Digit (0-9) recognition 18.2 Stock price prediction 18.3 Weather prediction 18.4 Brand monitoring 18.5 Traffic flow prediction
19. Considerations for AI-ML based system	19.1 Importance of data on AI-ML based system 19.2 The future with AI 19.3 AI Issues, Concerns and Ethical Conditions
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 Implemented searches with AI 1.2 Implemented Logic in AI 1.3 Implemented evaluating ML Models 1.4 Exercised ML Application in NLP 1.5 Exercised ML Applications in Computer Vision 1.6 Implemented ML based Project development 1.7 Addressed considerations for AI-ML based system
2. Underpinning knowledge	2.1 Introduction of AI and ML 2.2 History of AI 2.3 Weak and strong AI 2.4 AI and its applications 2.5 AI and ML current and future trends 2.6 Prospects of AI and ML 2.7 ML Applications 2.8 Branches of ML 2.9 Linear regression 2.10 Logistic regression 2.11 ML Model evaluation 2.12 NLP 2.13 Considerations for AI-ML based system

3. Underpinning skills	3.1 Working with AI 3.2 Working with Machine Learning (ML) 3.3 Solving problems with regression 3.4 Working with advanced features 3.5 Working with projects of ML
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn the document preparation process. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for the rights of peers, subordinates and seniors at the workplace. 4.8 Communication with peers, subordinates and seniors in the workplace. 4.9 Keeps a clean and orderly workplace and equipment.
5. Resource implication	The following resources must be provided: 5.1 Workplace (actual or simulated). 5.2 Tools, equipment and physical facilities appropriate to perform activities. 5.3 Materials consumable to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 Written test 6.2 Demonstration 6.3 Oral questioning
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited center. 7.2 Assessment should be done by NSDA certified/ nominated assessor

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code and Title	**OU-ICT-AIIT-04-L6-V1: Implement of Deep Learning**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to implement of deep learning. This specifically includes the task of working with Deep Learning (DL), analyzing of features, implementing DL features, and performing project development activities.
Nominal Hours	**60 Hours**
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables
1. Exercise Deep Learning (DL)	1.1 **Fundamentals of DL** is interpreted 1.2 Activities for **DL Tools and libraries** are performed 1.3 **Data preparation** is implemented 1.4 Manual and automatic data labelling are interpreted 1.5 Automatic labelling techniques are implemented
2. Analyze features	2.1 **Feature extraction** is implemented 2.2 Visualization of word vectors are implemented with word cloud, histogram, heatmap, plots and tableau. 2.3 **Embedding models** are exercised 2.4 **Pre-trained word embedding** is implemented
3. Implement DL features	3.1 **ANN and CNN** are comprehended 3.2 **CNN Variations** are implemented 3.3 **Optimization of hyperparameters** is implemented 3.4 **Recurrent neural networks** are implemented 3.5 **Ensemble of DL Models** is implemented
4. Perform project development activities	4.1 **Projects** are developed using DL 4.2 **Transformer based models** are interpreted 4.3 **Specific models** are designed 4.4 **Evaluation of DL models** are performed

Range of Variables	
Variable	**Range** (May include but not limited to:)
1. Fundamentals of DL	1.1 Why DL 1.2 Difference between ML and DL 1.3 Real-world applications of DL 1.4 Popular DL techniques
2. DL Tools and libraries	2.1 Anaconda 2.2 Google colab 2.3 Tensorflow 2.4 Keras

3. Data preparation	3.1 Data accumulation 3.2 Data cleaning 3.3 Noise removal 3.4 Data annotation 3.5 Annotation quality measures with kappa 3.6 Numeric mapping
4. Feature extraction	4.1 Understanding the data 4.2 Extracting the textual, visual, speech features 4.3 Normalization of features 4.4 Features fusion
5. Embedding models	5.1 Word representation 5.2 Embedding matrix 5.3 Word2Vec, FastText and Glove
6. Pre-trained word embedding	6.1 Implications of pre-trained word vectors 6.2 Tuning the word vectors 6.3 Embedding model evaluation (intrinsic and extrinsic)
7. ANN and CNN	7.1 Network design 7.2 Convolution operation 7.3 Max-pooling operation 7.4 Building network 7.5 Training, testing and validation
8. CNN Variations	8.1 AlexNet 8.2 VGG-19 8.3 GoogLeNet 8.4 ResNet-18 8.5 ResNet-152 8.6 MobileNet
9. Optimization of hyperparameters	9.1 Understanding parameters and hyperparameters 9.2 Tuning hyperparameters 9.3 Effect of hyperparameter tuning
10. Recurrent neural networks	10.1 Why RNNs 10.2 GRU, LSTM 10.3 Backpropagation 10.4 Vanishing gradient in RNNs 10.5 Bidirectional RNNs
11. Ensemble of DL Models	11.1 Why Ensemble 11.2 How to Ensemble 11.3 Average Ensemble 11.4 Weighted Ensemble 11.5 Voting Ensemble
12. DL Projects	12.1 Handwritten character recognition 12.2 Image classification 12.3 Object recognition 12.4 Face detection 12.5 Recommendation system

	12.6 Sentiment analysis 12.7 Emotion analysis 12.8 Text classification 12.9 Aggressive text detection 12.10 Multimodal meme detection
13. Transformer based models	13.1 Transformer based model definition 13.2 Why use Transformer based models 13.3 Transformer Vs. DL Models
14. Specific models	14.1 M-BERT 14.2 Distil-BERT 14.3 XML-R 14.4 ROBERTa
15. Evaluation of DL models	15.1 Performance matrices 15.2 Error Analysis
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 Developed projects using DL 1.2 Designed specific models 1.3 Performed evaluation of DL models
2. Underpinning knowledge	2.1 Why DL 2.2 Difference between ML and DL 2.3 Real-world applications of DL 2.4 Popular DL techniques 2.5 Data labelling 2.6 Feature extraction 2.7 Transformer based models 2.8 DL Models 2.9 DL Model Evaluation
3. Underpinning skills	3.1 Working with Deep Learning (DL) 3.2 Analyzing of features 3.3 Implementing DL features 3.4 Performing project development activities
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn the document preparation process. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for the rights of peers, subordinates and seniors at the workplace. 4.8 Communication with peers, subordinates and seniors in the workplace. 4.9 Keeps a clean and orderly workplace and equipment.

5. Resource implication	The following resources must be provided: 5.1 Workplace (actual or simulated). 5.2 Tools, equipment and physical facilities appropriate to perform activities. 5.3 Materials consumable to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 Written test 6.2 Demonstration 6.3 Oral questioning
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited center. 7.2 Assessment should be done by NSDA certified/ nominated assessor
Accreditation Requirements Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

Unit Code and Title	**OU-ICT-AIIT-05-L6-V1: Work with Immersive Technology**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to process forms. This specifically includes the tasks of comprehending basics of immersive technologies, comprehending emergence of XR in the workplace, working with Camera tracking and 3D Rendering for Immersive Environment, developing 3D Games and applications, and creating Mixed Reality (MR) Applications.
Nominal Hours	**100 Hours**
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables
1. Comprehend basics of immersive technologies	1.1 **Fundamentals of AR,VR,MR,XR** are interpreted 1.2 **Motion tracker, navigation tracker and controllers** are utilized 1.3 **Interfaces** are explored 1.4 **Human behind lenses** is interpreted 1.5 **Social context** for VR usage is interpreted
2. Comprehend emergence of XR in the workplace	2.1 **Areas and industries for immersive reality application** are interpreted 2.2 **Use-cases, applications and production pipelines** are exercised
3. Work with Camera tracking and 3D Rendering for Immersive Environment	3.1 **Inside-Out Camera tracking** is used 3.2 **Full-Body tracking** is used 3.3 **Rendering architecture** is comprehended 3.4 **Distributed VR Architectures** are comprehended
4. Develop 3D Games and applications	4.1 **Modelling the Physical World** is interpreted 4.2 **Sound in Immersive Environment** is comprehended 4.3 **Fundamentals of Unity Engine** are applied 4.4 **Development work** is performed with Unity 4.5 3D Mobile Games are developed 4.6 Interactive User Interfaces are developed 4.7 Mobile AR applications are developed 4.8 VR and XR Applications are developed
5. Create Mixed Reality (MR) Applications	1.1 **Fundamentals of MR** is interpreted 1.2 Cloud services for **MR applications** are used 1.3 **MR Apps and Hardware** are used 1.4 **Design and Development MR Application** are performed

Range of Variables	
Variable	**Range** (may include but not limited to):
1. Fundamentals of AR,VR,MR,XR	1.1 A brief history of AR, VR, MR, XR 1.2 Components of a AR, VR, MR, XR system 1.3 AR, VR, MR, XR similarities and differences

	1.4 Reality, Virtuality and Immersion 1.5 Current trend and state of the art in immersive technologies 1.6 C# 1.7 3D Game Engine
2. Motion tracker, navigation tracker and controllers	2.1 Position and motion 2.2 Inside-out, outside-in 2.3 Optical (active and passive) 2.4 Inertial and hybrid 2.5 HMD (Head mounted display) 2.6 Magnetic 2.7 Mechanical 2.8 Ultrasonic 2.9 Laser 2.10 Vision 2.11 Control devices
3. Interfaces	3.1 Navigation and manipulation interface 3.2 Tracker based Navigation and manipulation interface 3.3 Three dimensional probs and controllers 3.4 Data gloves and gesture interfaces
4. Human behind lenses	4.1 Human perception and cognition 4.2 Human visual system 4.3 Human auditory system 4.4 The human vestibular system 4.5 Physiology, psychology and the human experience
5. Social context	5.1 Adaptation and artefacts 5.2 Ergonomics 5.3 Ethics 5.4 Scientific concerns 5.5 VR Health and safety issues 5.6 Effects of VR simulations on users 5.7 Cybersickness: before and now 5.8 Guidelines for proper VR usage 5.9 User centered design 5.10 User experience 5.11 Ethical Code of Conduct
6. Areas and industries for immersive reality application	6.1 Entertainment 6.2 Education 6.3 Training 6.4 Medical 6.5 Industrial 6.6 Military
7. Use-cases, applications and production pipelines	7.1 From sensing to rendering 7.2 Mobile, standalone and high-end immersive computing platform 7.3 VR, Immersive Tech and the society 7.4 Impact professional life 7.5 Impact on Private life 7.6 Impact on Public Life

8. Inside-Out Camera tracking	8.1 Depth sensing 8.2 Microsoft HoloLens 8.3 Vrvana Totem 8.4 Low-cost AR and MR system 8.5 Mobile platform
9. Full-Body tracking	9.1 Inverse and forward Kinematics 9.2 Kinect 9.3 Intel Realsense 9.4 Full body inertial tracking 9.5 Ikinema 9.6 Holographic Video
10. Rendering architecture	10.1 Graphics Accelerator 10.2 3D Rendering API's, OpenGl, DirectX, Vulcan, Metal 10.3 Best practices and Optimization techniques
11. Distributed VR Architectures	11.1 Co-located rendering pipelines 11.2 Distributed virtual environment
12. Modelling the Physical World	12.1 Geometric Modelling 12.2 Kinematic Modelling 12.3 Behaviour Modelling 12.4 Model Management
13. Sound in Immersive Environment	13.1 Evaluation of sound system 13.2 Sound design basics
14. Fundamentals of Unity Engine	14.1 Familiarity with Unity engine 14.2 Set up and running the applications
15. Development work	15.1 Build interactivity with Timeline 15.2 Create Animated stories with Unity 15.3 Create compelling Shots with Cinemacine 15.4 Create High-Fidelity Lighting in the High-Definition Render Pipeline 15.5 Create Real-Time Visualization with Unity 15.6 DOTS (Data oriented technology stack) Fundamentals 15.7 Data-Oriented design
16. Fundamentals of MR	16.1 Explore MR devices 16.2 Understand Holograms 16.3 Design and develop in MR 16.4 Use cases and examples
17. MR applications	17.1 MR toolkit (Introduction, Set up and Use Hand Interaction) 17.2 Windows MR (Configure) 17.3 Resources (import and configure) 17.4 Interaction models 17.5 Add hand interaction scripts to an object 17.6

18. MR Apps and Hardware	18.1 Enhanced environment apps (HoloLens only) 18.2 Blended environment apps 18.3 Immersive environment apps 18.4 Techniques for expanding the design process 18.5 MR Hardware: HoloLens 2, Immersive Headset
19. Designing Holograms are made	19.1 Designing for MR by exploring the Doll House 19.2 1:1 vs 1:10 prototypes 19.3 Using MR Capture 19.3.1 Manipulating captures and virtual objects 19.3.2 Head Gaze Adjustment 19.4 UI creative process
20. Design and Development MR Application	20.1 Structural element 20.1.1 App model 20.1.2 Coordinate system 20.1.3 Spatial mapping 20.1.4 Scene understanding 20.2 Interactions 20.2.1 System gesture 20.2.2 Instinctual interaction 20.2.3 Hands and motion controller model 20.2.4 Hand-free model 20.2.5 Eye-based interaction 20.3 User Experience 20.3.1 Visual 20.3.2 Special sound 20.3.3 Controls 20.3.4 Behaviors
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of the current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 Used cloud services for MR applications 1.2 Used MR Apps and Hardware 1.3 Performed Design and Development MR Application
2. Underpinning knowledge	2.1 Fundamentals of AR, VR, MR, XR 2.2 Motion tracker, navigation tracker and controllers 2.3 Human behind lenses 2.4 Social context for VR 2.5 Areas and industries for immersive reality application 2.6 Inside-Out camera tracking 2.7 Full-Body Tracking 2.8 Rendering Architecture 2.9 Distributed VR Architecture 2.10 Sound in Immersive Environment 2.11 Fundamentals of Unity Engine 2.12 Fundamentals of MR 2.13 MR Applications and Hardware

3. Underpinning skills	3.1 Comprehending basics of immersive technologies 3.2 Comprehending emergence of XR in the workplace 3.3 Working with Camera tracking and 3D Rendering for Immersive Environment 3.4 Developing 3D Games and applications 3.5 Creating Mixed Reality (MR) Applications
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn the document preparation process. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for the rights of peers, subordinates and seniors at the workplace. 4.8 Communication with peers, subordinates and seniors in the workplace. 4.9 Keeps a clean and orderly workplace and equipment.
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7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited center. 7.2 Assessment should be done by NSDA certified/ nominated assessor

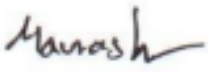
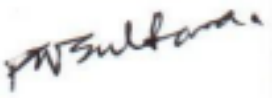
Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Development of Competency Standard

The Competency Standards for National Skills Certificate in AI in Immersive Technology, Level-6 is developed by NSDA on 24-26 July 2023.

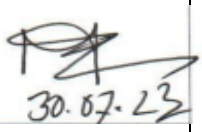
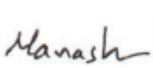
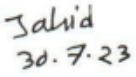
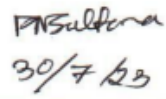
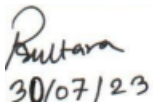
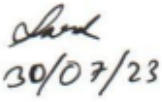
List of Members

S/N	Name and Address	Position in the committee	Signature and Date
1.	Zahed Ahmed Chowdhury, Chief Instructor & HoD, Computer Science & Technology, Dhaka Polytechnic Institute. Cell: 01676041925, Email: zahed.sylhet.official@gmail.com	Member	
2.	Md. Nasimul Kader, Senior Faculty, Daffodil International University, Cell: 01712949753, Email: nasimulkader@daffodil.ac	Member	
3.	Manash Sarker, Assistant Professor, Department of Computer and Communication Engineering, Patuakhali Science and Technology University, Cell: 01712149555, email: manash.sarker@pstu.ac.bd	Member	
4.	Md Rashed Karim, Managing Director, Full Stack Ltd., Authorized Trainer, ISTQB, Assessor, BTEB, Cell: 01711605286, Email: mail4rashed@gmail.com	Member	
5.	Fouzia Nigar Sultana, Managing Director, Infobahn Realm IT Solution. Cell: 01819270882, Email: nigar@infobahnrealm.com	Member	
6.	Md.Aiub Ali , Lead Trainer, Mobile Apps Development, BASIS - SEIP Project Tranche 3, Cell:01738717829, email: aiubali29@gmail.com	Member	
7.	Mahbub Huda, Consultant, Specialist, NSDA, Email: huda73@gmail.com, Mobile: 01735490491.	Member	

Validation of Competency Standard

The Competency Standards for National Skills Certificate in AI in Immersive Technology, Level-6 is validated by NSDA on 30 July 2023.

Members of the SCVC

S/N	Name and Address	Position in the committee	Signature and Date
1.	Shafquat Haider, Chairman, ICT ISC, ciproco@bol-online.com, shafquat.haider@gmail.com, Mobile No. 01711532597	Chairperson	
2.	Md. Mahabul Alam, Assistant Maintenance Engineer, Bangladesh Hi-Tech Park Authority, Cell: 01719544128, Email: mahabul.eee01@gmail.com	Member	
3.	Manash Sarker, Assistant Professor, Department of Computer and Communication Engineering, Patuakhali Science and Technology University, Cell: 01712149555, email: manash.sarker@pstu.ac.bd	Member	
4.	Kazi Jahid Hasan, Lecturer, MCT, Daffodil International University, Cell: 01317516455	Member	
5.	Fouzia Nigar Sultana, Managing Director, Infobahn Realm IT Solution. Cell: 01819270882, Email: nigar@infobahnrealm.com	Member	
6.	Rezwana Sultana, Assistant Programmer, Department of ICT, Attached officer, 4IR Team, a2i, Cell:016271.6272, Email: rezwana.doict@gmail.com	Member	
7.	Sarah Ahsin, Young Profess, 4IR Team, a2i, Cell: 01677446677, Email: sarah.ahsin@a2i.gov.bd	Member	
8.	Mahbub Huda, Consultant, Specialist, NSDA, Email: huda73@gmail.com, Mobile: 01735490491.	Member	