

NATIONAL COMPETENCY STANDARDS
FOR
CYBERSECURITY-AI TECHNOLOGIST (DIPLOMA)

ICT SECTOR

TECHNICAL & VOCATIONAL EDUCATION AND TRAINING
QUALITY COUNCIL
BHUTAN QUALIFICATIONS AND PROFESSIONALS
CERTIFICATION AUTHORITY
THIMPHU, BHUTAN
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FOREWORD

The TVET Quality Council, BQPCA, is pleased to present the National Competency Standards (NCS) for **Cybersecurity-AI Technologist**, diploma, developed in collaboration with industry experts and trainers with generous technical and funding support from Bhutan Education and Skills Training (BEST) Project, Humber College, Canada and Global Affairs, Canada. These standards establish a nationally recognized qualification aligned with international best practices, setting a benchmark for TVET qualifications in Bhutan.

The NCS ensures that trainees acquire the necessary skills, knowledge, and attitude required by industries. Developed through close consultation with experts, it enhances the relevance of training to labor market needs, equipping graduates to meet industry expectations and improving their employability. A strong and responsive TVET system will also make vocational education more attractive to youth.

The Council acknowledges the valuable contributions of the industry experts and trainers, financial and technical assistance of BEST Project, Humber College and Global Affair Canada in the development of these standards. We urge employers and training providers to continue their support in implementing the NCS, fostering a skilled and productive workforce that contributes to national socio-economic development. Moving forward, we look forward to enhanced industry engagement and collaborative efforts in building a quality-assured, demand-driven TVET system.

Director
BQPCA

ACKNOWLEDGEMENT

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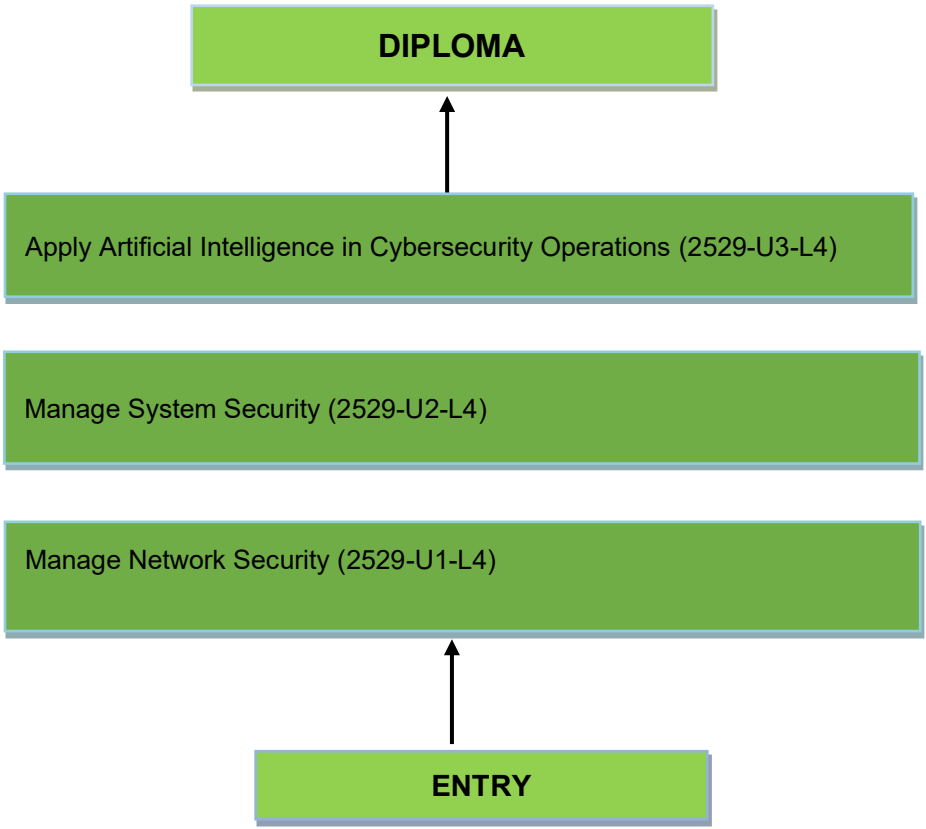
This National Competency Standard (NCS) was developed with the invaluable technical support from Humber Polytechnic, Canada, and with funding support from Global Affairs Canada through BEST Project Bhutan. Their contributions were instrumental in the successful development of this NCS.

The TVET Quality Council under the Bhutan Qualifications and Professional Certification Authority expresses its sincere appreciation to all industry professionals and subject matter experts who generously contributed their time and expertise to the development of the National Competency Standards for Cybersecurity-AI Technologist.

The names of the contributors are listed below in recognition of their valuable support.

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PACKAGING OF QUALIFICATIONS



OVERVIEW OF THE NCS

Unit Title	Element of Competence
1. Manage Network Security	1.1 Perform Network Security Need Assessment 1.2 Apply Network Security Services 1.3 Manage and Monitor Network Security
2. Manage System Security	2.1 Determine Anomalies in the System 2.2 Manage System Access and Controls 2.3 Perform Application and Web Security 2.4 Maintain Information Security
3. Apply Artificial Intelligence in Cybersecurity Operations	3.1 Implement AI solution for Cybersecurity 3.2 Analyze Security Data 3.3 Apply Adversarial AI Techniques

UNIT TITLE	Manage Network Security
DESCRIPTOR	This unit covers the competencies required to perform network security need assessment, apply network security services and manage and monitor network security.
CODE	2529-U1-L4
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Perform Network Security Need Assessment	1.1 Identify the organizational network infrastructures and end user devices following standard procedure 1.2 Discover and manage organization's ICT assets following standard procedure 1.3 Perform security assessment in the organization's network following standard procedure 1.4 Produce security assessment report following standard procedure 1.5 Analyze the report to determine network security requirements following standard procedure

2. Apply Network Security Solutions	2.1 Install and configure network security solutions following standard procedures 2.2 Write firewall policy, intrusion and detection rules following standard procedures 2.3 Troubleshoot the network security issues following standard procedures 2.4 Deploy network security solutions in an organization following standard procedure
3. Manage and Monitor Network Security	3.1 Identify the network monitoring tools following standard procedure 3.2 Install, configure and maintain network monitoring tools following standard procedure 3.3 Monitor and analyze the networks following standard procedure 3.4 Report and mitigate network security incidents following standard procedure

RANGE STATEMENT	
Network security solutions may include but not limited to:	
• Firewall • VLAN • VPN • IDPS	• DNSSEC • TLS • email security • SSH
Monitoring and Assessment tools may include but not limited to:	
• Libre NMS	• Wireshark

• SIEM • Vulnerability Assessment Tools	
Networks may include but not limited to:	
Infrastructure	Traffic
Critical Aspects	
• Demonstrate compliance with occupational health and safety regulations applicable to worksite operation • Install, configure and maintain network security services following standard procedures	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and Integrity • Occupational Health and Safety • (OHS) Regulations • Definition and Terminologies on • Network security • Security concepts and its • principles • Basic concepts of cloud security • Basic concepts of Cryptography • Network Security Hardening • Security risk management • Threats and vulnerabilities • Types of cyber-attacks and • crimes • Intellectual Property rights • Relevant rules and regulations	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Creativity • Time Management • Innovation • Coordination • Entrepreneurship • Growth oriented • Attention to details

• related to cyber security Existing vegetation and ecological assessment	

UNIT TITLE	Manage System Security
DESCRIPTOR	This unit covers the competencies required to determine anomalies, manage system access and controls, perform application and web security and maintain information security following safety at all times
CODE	2529-U2-L4
ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Determine Anomalies in the System	1.1 Identify different system log files Analyze the system logs to determine the anomalies 1.2 Mitigate and report the system incidents following standard procedures 1.3 Perform operating system hardening following standard procedures
2. Manage System Access and Controls	2.1 Perform users and groups management following standard procedures 2.2 Grant user privileges and access controls to the systems and files 2.3 Perform different types of system control following standard procedures

3. Perform Application and Web Security	3.1 Identify application related threats and vulnerabilities 3.2 Conduct web security testing using Open Web Application Security Project (OWASP) following standard procedures 3.3 Apply different counter measures following standard procedures 3.4 Perform software hardening following standard procedures 3.5 Perform vulnerability and patch management following standard procedures
4. Maintain Information Security	4.1 Maintain data confidentiality using Encipherment 4.2 Maintain data integrity using checksum tools 4.3 Maintain data privacy using Encipherment and Access Control List 4.4 Perform data backup and recovery following standard procedures 4.5 Perform information classification following standard procedures

RANGE STATEMENT	
Different system log files may include but not limited to:	
• Message log	• Mail log

• Syslog • Events log	• View Log
Types of system control may include but not limited to:	
• Mandatory access control • Discretionary access control	• Role-based access control
Threats may include but not limited to:	
• Unauthorized access • Malware	• Alteration
Web security testing may include but not limited to	
• Static • Dynamic	• Penetration testing
Different counter measures may include but not limited to	
• Authentication • Authorization	• Encryption
Data confidentiality may include but not limited to	
• Email encryption • SSL certificate	• Email encryption • SSL certificate
Critical Aspects	
• Demonstrate compliance with occupational health and safety regulations applicable to worksite operation. • Grant user privileges and access controls to the systems and files following standard procedures • Perform different types of system control following standard procedures	

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and Integrity • Occupational Health and Safety • (OHS) Regulations • Cryptography (Encryption and • decryption, Hash functions) • File system • Basic digital forensics • Social Engineering • Device management • Emerging technology security • User authentication, authorization and accounting • Types of Operating System • Operating System hardening • General Data Protection	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Time Management • Innovation • Entrepreneurship • Growth oriented • Attention to details

UNIT TITLE	**Apply Artificial Intelligence in Cybersecurity Operations**
DESCRIPTOR	This unit covers the competencies required to implement AI solution for cybersecurity, analyze security data and apply adversarial AI techniques
CODE	**2529-U3-L4**
ELEMENTS OF COMPETENCE	**PERFORMANCE CRITERIA**
1. Implement AI solution for Cybersecurity	1.1 Identify cybersecurity tasks that can be optimized using appropriate AI solution. 1.2 Install, configure and integrate selected AI solution into existing environment 1.3 Apply AI solution to solve cybersecurity tasks 1.4 Verify AI solution performance against expected outcomes
2. Analyze Security Data	2.1 Identify relevant cybersecurity data sources 2.2 Apply data analytics to identify patterns, indicators and anomalies 2.3 Interpret analysis results to support cybersecurity tasks 2.4 Use analyzed data to anticipate potential security issues

	2.5 Validate effectiveness of security controls using analysis results
3. Apply Adversarial AI Techniques	3.1 Identify basic weaknesses in AI-based systems 3.2 Apply simple adversarial techniques to test systems 3.3 Conduct basic attack simulations on AI models 3.4 Observe and record system responses 3.5 Recommend improvements to strengthen AI system security

Critical Aspects
• Demonstrate competencies to integrate AI to optimize cybersecurity task • Demonstrate competencies to secure AI system

UNDERPINNING KNOWLEDGE	**UNDERPINNING SKILLS**
• Ethics and Integrity • AI foundation including ethics • Python for Security • Data Science Basics • Security Automation • Basics of network, systems and application • Cyber security operation	• Team Work • Communication • Problem Solving • Interpersonal Relationship • Coordination • Time Management • Innovation

• Penetration testing, • Incident Management, • Vulnerability Management	• Entrepreneurship • Growth oriented • Attention to details

ANNEXURE

National Competency Standards (NCS)

The National Competency Standards specify the skill, knowledge and attitudes applied to a particular occupation. Standards also specify the standards or criteria of performance of a competent worker and the various contexts in which work may take place. Standards provide explicit advice to assessors regarding the skill and knowledge to be demonstrated by candidates seeking formal recognition either following training or through work experience.

Purpose of National Competency Standards

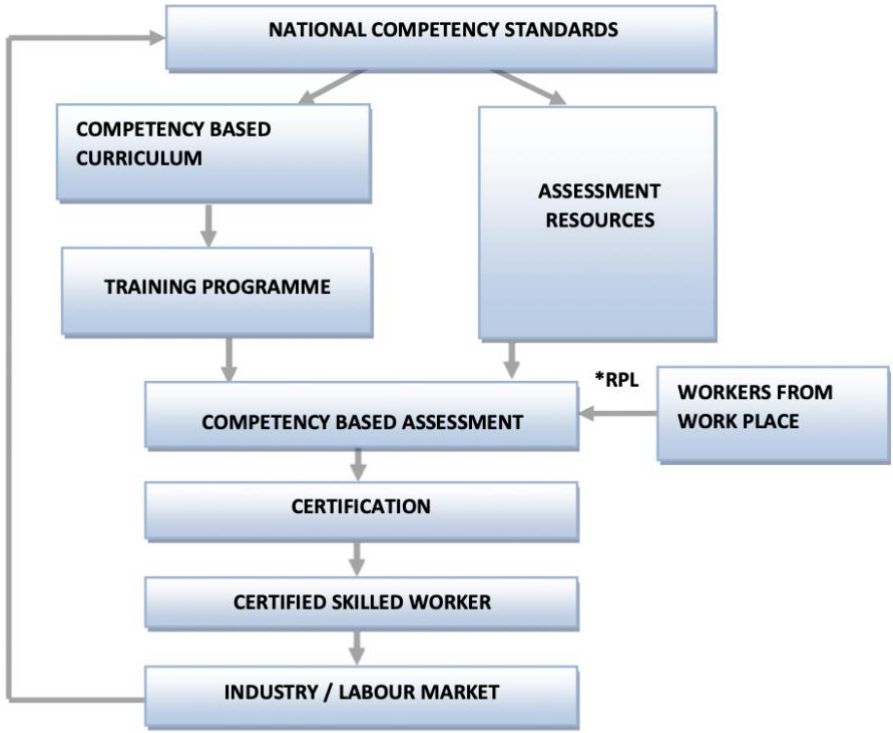
National Competency Standards serve a number of purposes including:

- Providing advice to curriculum developers about the competencies to be included in the curriculum.
- Providing specifications to assessment resource developers about the competencies within an occupation to be demonstrated by candidates.
- Providing advice to industry/employers about job functions, which in turn can be used for the development of job descriptions, performance appraisal systems and work flow analysis.

Bhutan Qualifications Framework (BQF)

Bhutan Qualifications Framework is an integrated national framework that outlines all types of qualification in Bhutan. As an established and nationally accepted instrument, the BQF has been benchmarked against international practices in terms of standards. The BQF aims to recognize all forms of learning systems, including formal, non-formal, and informal learning. It acknowledges technological advancements and recognizes contemporary modes of delivery. It covers a broad range of education systems including the TVET education.

Implementation of TVET Qualifications



*** RPL = Recognition of Prior Learning**

TVET Qualifications Levels

TVET Qualifications have seven levels as per the BQF, as follows:

Bhutan Qualifications Framework 2023

Table 2: Qualification Types and Levels Based on Education Sector.

BQF Level	Community Education	School Education	TVET	Higher Education	Monastic Education
8				Doctoral Degree	*Khewang* མཁས་དབང་།
7			Master's Degree Postgraduate Diploma Postgraduate Certificate	Master's Degree Postgraduate Diploma Postgraduate Certificate	*Tsugla Gongma* གསུག་ལག་གོང་མ།
6			Applied Degree	Bachelor's Degree Bachelor's Degree (Honours) Graduate Diploma Graduate Certificate	*Tsugla Wogma* གསུག་ལག་འོག་མ།
5			Advanced Diploma	Advanced Diploma	
4			Diploma	Diploma	
3		Bhutan Higher Secondary Education Certificate	Certificate 3		*Dringrim Gongma* འབྲིང་རིམ་གོང་མ།
2		Bhutan Certificate for Secondary Education	Certificate 2		*Dringrim Barma* འབྲིང་རིམ་བར་མ།
1	ALC		Certificate 1		

Level Descriptors

The TVET Qualification levels are set based on the level descriptors, as defined in the BQF. The detail of the qualification level descriptor is as follow:

Level	***Knowledge***	***Skills***	***Values***	***Application***
	Knowledge that is:	***Demonstrate skills that involve:***	***Demonstrate values that involve:***	***Applied in contexts that involve:***
4	Broad theoretical, technical and operational	Selecting and applying a range of standard processes relevant to varied and sometimes unpredictable tasks Selecting and applying a range of solutions involving formulation of solutions to resolve complex issues Demonstrating a high level of proficiency in English and Dzongkha	Strong level of awareness of self and others; and an appreciation of belief system, role of social norms, and the importance of relationship building Application of ethical norms and legal rules in decision-making; and comprehending the correlation between values and behavior Commitment to own profession	Stable tasks with predictable changes Broad guidance with some self-direction that requires sound judgement Taking some responsibility for planning and coordination with others

			and quality of work	
3	Theoretical with some technical and operational processes	Applying a range of standard processes to known but varied tasks Selecting and applying a range of solutions to familiar and unfamiliar problems Communicating effectively and clearly, both oral and written, in both English and Dzongkha	Sound level of self-awareness and beliefs; and ability to apply social norms and build relationships Application of a set of ethical norms Commitment to own field of interest and apply self-management of learning and performance	Stable tasks with some aspects of change General guidance and supervision that require discretion and judgement Adapting to own behaviour to work with others
2	Basic, factual and conceptual	Applying standard processes relevant to carry out known tasks Applying a set of known solutions to solve simple and straightforward issues Using simple and direct exchange of information on familiar and routine matters	Some level of self-awareness and beliefs, and appreciation of social norms; and significance of relationships Awareness of	Structured and stable tasks General support and Supervision that require some discretion and judgement Collaboration with others to achieve goals

		Developing basic proficiency in Dzongkha and English	ethical norms, and openness to different activities Developing own knowledge and skills	
1	Foundational, every day and general	Applying operational literacy, numeracy skills required to carry out simple tasks Applying simple solutions to solve simple and straightforward everyday issues Communicating using everyday expressions and simple phrases in Dzongkha and English	Basic awareness of self, beliefs, and social norms; and understand the significance of relationships Basic awareness of fundamental ethical norms, basic civil rights, and responsibilities Willingness to understand tasks and motivated to implement them successfully	Highly structured tasks with close support and supervision Minimal Discretion and judgement Readiness to work together and share knowledge with others

CODING USED FOR NATIONAL COMPETENCY STANDARDS

The coding and classification system developed in Bhutan is logical, easy to use, and also aligned with international best practices. The Bhutanese coding and classification system is based on the International Standard Classification of Occupations, 2008 (ISCO-08) developed by the International Labour Organisation (ILO).The coding of the National competency standards forms the basis of the identification code for the Technical & Vocational Education and Training Management Information System (TVET – MIS) both in terms of economic sector identification and that of the individual standard.

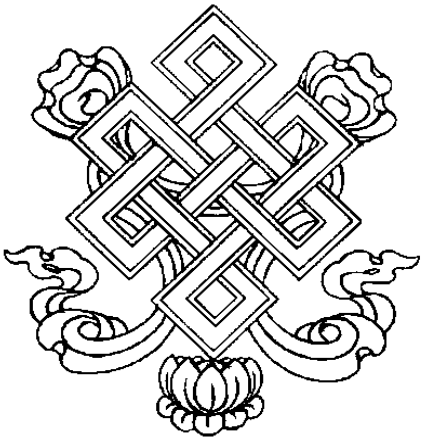
Coding the individual national competency standards

Coding the individual skills standard has a multiple purpose:

- to identify the level,
- to identify to which module the standard belongs,
- to identify in which order the standard is clustered within that module.

A job can include a number of competencies described in the national competency standards.

However, in order to follow a logical order, only national competency standards related to each other and following a logical sequence in terms of training delivery, from the simple to the complex, are clustered into a module. Some standards are so complex that they need to stand alone.



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