



Technical and Vocational Education and Training (TVET) Council



## **Occupational Standards of Competence**

# **Robotics**

## **Level 2**

Hastings House West, Balmoral Gap, Hastings, Christ Church, Barbados  
Telephone: (246) 435-3096 Fax: (246) 429 2060 E-mail: [office@tvetcouncil.com.bb](mailto:office@tvetcouncil.com.bb).

Published by:  
The Technical and Vocational Education and Training Council  
Hastings House West  
Balmoral Gap, Hastings  
Christ Church  
BB14033  
Barbados  
Tel: (246)435 - 3096  
Fax: (246)429-2060  
Email: [office@tvetcouncil.com.bb](mailto:office@tvetcouncil.com.bb)      Website: [www.tvetcouncil.com.bb](http://www.tvetcouncil.com.bb)

Every effort has been made to ensure that the information contained in this publication is true and correct at the time of publication. However, the TVET Council's products and services are subject to continuous development and improvement and the right is reserved to change products and services from time to time. TVET Council cannot accept any liability for any loss or damage arising from the use of information in this publication.

© TVET Council 2022

## ACKNOWLEDGEMENTS

The Technical and Vocational Education and Training Council wishes to thank the following for their contribution to the development of this document.

### Technical Experts for Robotics Level 2

Mrs. Catherine Gibson	-	Tutor, Erdiston Teachers' Training College
Mr. Paul Grant	-	Science Lab Technician, Erdiston Teachers' Training College
Mr. Gregory Grazette	-	Teacher of Robotics and Computer Science, STEAM Lab Facilitator, Jefferson County Public Schools, Kentucky, USA
Ms. Carrol Griffith	-	Technical Officer , Technical and Vocational Education and Training (TVET) Council
Mr. Akil Thompson	-	Technical Officer, Technical and Vocational Education and Training (TVET) Council

### Members of the Validation Committee

Mr. Charles Cyrus	-	Director, Ministry of Industry, Innovation, and Smart Technology
Ms. Gloria Greene	-	Information Technology Coordinator, St. Leonard's Boys' School, Chair of Committee for Development of Robotics Curriculum for Schools, Certified Assessor, IV and EV for Using ICT
Dr. Albert Bartlett	-	Deputy Principal, Christ Church Foundation School, Teacher of Coding/Robotics
Professor Cardinal Warde	-	Caribbean Science Foundation, Executive Director, Professor of Electrical Engineering, Massachusetts Institute of Technology

# **Qualification Overview**

**NVQB**

**in**

**Robotics**

**Level 2**

### Qualification Overview

This qualification is designed to provide training, assessment and certification for persons within the robotics industry. The robotics industry is a rapidly growing sector showing economic growth and contribution to overall workforce development. Training institutions and employers can use this qualification to support trainees and employees in developing their knowledge and skills in the field of robotics.

Candidates at this level must demonstrate the required skills, knowledge and attitudes to use and maintain robotics systems to achieve simple tasks and be able to:

- operate robots with peripherals such as controllers
- investigate, diagnose and resolve unexpected maintenance problems (such as electrical and mechanical faults)
- programme robots using intermediate block-based coding
- contribute to design and iterative processes

Like all NVQs this qualification is competence based. This means that it is linked to the candidate's ability to competently perform a range of tasks connected with their work. Candidates must plan a programme of development and assessment with their assessors and compile a portfolio of evidence to prove that they are competent in their work role.

### Who is this qualification for?

The NVQB in Robotics Level 2 is aimed at robotics technicians who work with flexible automation and may help design, build, programme, test, operate and maintain robotics systems.

### Jobs within the occupational area:

Semi-skilled Robotics Technician

### Where can it be used?

This qualification can be used in the health care, manufacturing, engineering and service industries where persons are required to build, programme, test, operate and maintain robotics systems.

## A011502 – APPROVED NATIONAL VOCATIONAL QUALIFICATION STRUCTURE

### ROBOTICS LEVEL 2

To achieve a full award, candidates must complete all eleven (11) mandatory units.

<b><u>Mandatory Units (All must be completed)</u></b>	<b><u>CODES</u></b>
<b>1. Manage personal and professional development</b>	<b>UA49302</b>
1.1 Organise work	
1.2 Direct own learning	
1.3 Review performance	
<b>2. Maintain codes of conduct and safety procedures in the workspace</b>	<b>UA49402</b>
2.1 Confirm procedures to be maintained	
2.2 Coordinate safe work practices	
2.3 Improve performance	
2.4 Complete work activities	
<b>3. Collaborate with others</b>	<b>UA49502</b>
3.1 Communicate with individuals from diverse backgrounds	
3.2 Deal with cultural misunderstandings	
3.3 Work with others	
<b>4. Investigate new robotics technologies</b>	<b>UA50302</b>
4.1 Research new technologies	
4.2 Explore new technologies	
4.3 Monitor the performance of new robotics technologies	
<b>5. Design robots and robotics systems</b>	<b>UA50402</b>
5.1 Prepare for the design process	
5.2 Confirm the elements of robots and robotics system	
5.3 Devise robots and robotics systems	
5.4 Evaluate designs	
<b>6. Test and operate robots and robotics systems</b>	<b>UA50502</b>
6.1 Conduct pre-operational checks	
6.2 Evaluate robots and robotics systems	
6.3 Use robots and robotics systems	
6.4 Shut-down robots and robotics systems	

<b>Mandatory Units (All must be completed)</b>	<b>CODES</b>
<b>7. Train others in robotics systems</b>	<b>UA50602</b>
7.1 Prepare for training	
7.2 Deliver training	
7.3 Evaluate training	
<b>8. Incorporate computer technology in robotics systems</b>	<b>UA50702</b>
8.1 Select computer technology	
8.2 Integrate computer technology	
8.3 Maintain incorporated technology	
<b>9. Operate a smart device</b>	<b>UA50802</b>
9.1 Start smart device	
9.2 Use smart device	
9.3 Shut down smart device	
<b>10. Use intermediate coding to programme robots</b>	<b>UA50902</b>
9.1 Confirm task requirements	
9.2 Build code to meet task requirements	
9.3 Run and check code	

## UA49302

## Manage personal and professional development

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to manage self and improve skills. It also deals with managing tasks to achieve required outcomes and looks at learning needs and reviewing performance to improve oneself.

**ELEMENT****PERFORMANCE CRITERIA**

*Candidates must be able to:*

- |                        |  |
|------------------------|--|
| 1. Organise work       | <ul style="list-style-type: none"> <li>1.1 Consult with relevant persons to establish work priorities and timelines according to organisational procedures.</li> <li>1.2 Plan work and manage own time so that tasks are completed in order of priority and established timelines.</li> <li>1.3 Reschedule and re-prioritise where necessary to accommodate important variations in work assigned.</li> <li>1.4 Document details of work tasks and outcomes according to organisational procedures.</li> <li>1.5 Identify <b>difficulties</b> and changes affecting work performance, record and report to relevant persons according to organisational procedures.</li> <li>1.6 Maintain and update records of work completed and commitments made according to organisational procedures.</li> </ul> |
| 2. Direct own learning | <ul style="list-style-type: none"> <li>2.1 Identify skills and competency requirements for effective performance through research and consultation with relevant persons.</li> <li>2.2 Identify own learning requirements to achieve work assigned and address gaps in the required skills and competencies for effective performance of work.</li> <li>2.3 Liaise and consult with relevant persons to create opportunities to meet learning requirements within the limits of own and organisational authority.</li> </ul>   |



- 2.4 Use available strategies and methods as opportunities to improve learning requirements and collect evidence to show achievements.
    - 2.5 Obtain and act on constructive feedback to improve own performance.
  3. Review performance
    - 3.1 Conduct self-checks and seek feedback from relevant persons on work progress and ways of improving own performance.
    - 3.2 Assess feedback received and apply as necessary to improve own performance.
    - 3.3 Identify gaps between current skill set and that required for the work role.
    - 3.4 Consult with relevant persons and create a development plan to address gaps in competencies and performance.
    - 3.5 Identify support mechanisms to assist in the development of own performance.
    - 3.6 Assess own performance after the implementation of improvement measures and record results according to organisational procedures.
    - 3.7 Continue to monitor performance and introduce further improvement measures as required.
    - 3.8 Maintain personal health and safety and follow environmental regulations and guidelines while working.

**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Difficulties** may include but are not limited to:

- Personal
- Environmental
- Interpersonal
- Intrapersonal

**UNDERPINNING KNOWLEDGE AND SKILLS**

*Candidates must know and understand:*

1. How and why it is important to consult with relevant persons to establish work priorities and timelines and what are the organisational procedures for doing so.
2. How to plan work activities and which methods to use to manage time so that tasks are completed in order of priority and established timelines.
3. When to reschedule and re-prioritise work to accommodate important variations in work assigned.
4. What are the organisational procedures for accurately documenting details of work tasks and outcomes.
5. How and why it is important to identify difficulties and changes affecting own work performance.
6. When and how to record and report difficulties and changes affecting own work performance to relevant persons.
7. Why it important to maintain records and update documents of work tasks and commitments according to organisational procedures.
8. How to identify skills and competency requirements for effective performance of work through research and consultation with relevant persons.
9. Why it is important and how to identify own learning requirements to achieve work.
10. How to address gaps in skills and competencies required for effective work performance.
11. When to liaise and consult with relevant persons to create opportunities to meet learning requirements within the limits of individual and organisational authority.
12. What are available strategies and methods and when to use them to create opportunities to improve learning requirements.
13. How to and why it is important to collect evidence to show achievements of learning.
14. How to receive and act on constructive feedback obtained and what are the organisational procedures for doing so.
15. When and how to carry out self checks on work progress.
16. Why it is important to seek feedback from relevant persons on work progress and what are the ways of improving performance.
17. How to assess feedback given on own performance and how to apply it appropriately to improve performance.
18. How to identify gaps between own current skill set and that required for the work role.
19. When to consult with relevant persons and how to create a development plan.
20. What are the organisational procedures for developing a development plan.

21. What are and how to identify support mechanisms to help in the development of own performance.
22. How to assess own performance after the implementation of improvement measures.
23. How to record results and why it is important to continue to monitor performance and introduce further improvement measures as required.
24. How to maintain personal health and safety and follow environmental regulations and guidelines while working.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

### (2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

### (3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidates must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, products and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **must not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

## UA49402

**Maintain codes of conduct and safety procedures in the workspace**

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to maintain established codes of conduct and safety procedures for the robots and robotics systems workspace. These safety procedures are based on the legal regulations for the personal health, safety and environmental requirements that must be complied with for safe work. The unit also covers how to be proactive in keeping current with the necessary regulations.

**ELEMENT****PERFORMANCE CRITERIA***Candidates must be able to:*

- |  |   |
|--|---|
| 1. Confirm procedures to be maintained | <ul style="list-style-type: none"> <li>1.1 Consult with relevant persons to identify <b>codes of conduct</b> and <b>safety procedures</b>, regulations and legislation applicable to working with robots and robotics systems.</li> <li>1.2 Contribute to the documentation of identified procedures applicable to the robots and robotics systems workspace.</li> <li>1.3 Communicate and summarise own and other persons' responsibilities and expectations working within the assigned workspace according to organisational procedures.</li> <li>1.4 Agree upon with relevant persons, identified procedures that must be maintained according to organisational objectives.</li> <li>1.5 Maintain communication on <b>codes of conduct</b> and <b>safety procedures</b> by asking questions and seeking clarity on matters from relevant persons.</li> </ul> |
| 2.. Conduct safe work practices        | <ul style="list-style-type: none"> <li>2.1 Select and wear the appropriate personal protective equipment for the task according to organisational and occupational health and safety requirements.</li> </ul>   |

- 2.2 Select and use safety equipment, tools and materials necessary for the task according to organisational and occupational health and safety requirements.
  - 2.3 Follow safety signs and symbols as per established regulations.
  - 2.4 Provide information to relevant persons to demonstrate own understanding of what is required of the tasks.
  - 2.5 Work in safe manner and adhere to confirmed **codes of conduct** and **safety procedures** for the workspace according to organisational and occupational health and safety requirements.
  - 2.6 Deal with inappropriate behaviours and report, and resolve issues raised within the limits of own authority to relevant personnel according to organisational procedures.
  - 2.7 Record and report to relevant persons, possible hazards or unsafe practices observed or experienced while working according to organisational procedures.
3. Improve performance
  - 3.1 Reflect on own performance and encourage others to reflect on their performance using approved organisational methods.
  - 3.2 Identify and record possible areas for improvement as an outcome of the reflection process according to organisational procedures.
  - 3.3 Contribute constructive feedback and make recommendations to relevant persons regarding general adherence to **codes of conduct** and **safety regulations**.
4. Complete work activities
  - 4.1 Review completed tasks and document according to organisational procedures.
  - 4.2 Shut-down and store equipment, tools and machinery used according to manufacturer's guidelines and organisational procedures.

4.3 Document information according to organisational procedures.



**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Codes of conduct** may include but are not limited to:

- Acceptable language
- Acceptable behaviours
- Hygiene standards

**2. Safety procedures** may include but are not limited to:

- Personal e.g. personal protective equipment (PPE)
- Equipment, machinery, tools
- Environment e.g. use of chemicals, disposal of materials
- Space

**UNDERPINNING KNOWLEDGE AND SKILLS**

*Candidates must know and understand:*

1. How to consult with relevant persons to identify codes of conduct and safety procedures, regulations and legislation that are applicable to working with robots and robotics systems.
2. How to agree on and why it is important to know and understand the codes of conduct and safety procedures that must be maintained for safe work.
3. How and when to contribute to the documentation of identified procedures that are applicable to robots and robotics systems workspace.
4. How to communicate effectively and the importance of maintaining regular communication.
5. How to summarise own and others' responsibilities and expectations within the workspace.
6. How to and why it is important to ask questions and seek clarity on matters from relevant persons.
7. Which personal protective equipment to select and how to use it effectively.
8. What safety equipment is required for use with equipment, tools and materials.
9. What do safety signs and symbols mean.
10. How to demonstrate an understanding of what is required for tasks to relevant persons.
11. Why it is important to work safely adhering to codes of conduct and safety procedures and how to do so.
12. How to deal with inappropriate behaviours and resolve and report issues raised within the limits of own authority according to organisational procedures.
13. What are the organisational recording and reporting procedures for possible hazards or unsafe practices observed or experienced while working.
14. Which methods to use in reviewing completed tasks.
15. What are the organisational procedures for documenting information.
16. How to and why it is important to reflect on own performance.
17. How to encourage others to reflect on their own performance using approved organisational methods.
18. How to identify and record possible areas for improvement as an outcome of the reflection process according to organisational procedures.
19. When to contribute constructive feedback and make recommendations to relevant persons regarding general adherence to codes of conduct and safety regulations.
20. How to safely shut-down and store equipment, tools and machinery used according to manufacturer's guidelines and organisational procedures.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

### (2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

### (3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidates must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, products and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **must not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

## UA49502

## Collaborate with others

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to work collaboratively with others. It covers communicating with individuals from diverse backgrounds and dealing with cultural misunderstandings.

**ELEMENT****PERFORMANCE CRITERIA**

*Candidates must be able to:*

- |  |   |
|--|---|
| 1. Communicate with individuals from diverse backgrounds | <ul style="list-style-type: none"> <li>1.1 Confirm approved methods of communication according to organisational procedures.</li> <li>1.2 Use effective listening skills, ask questions to gain additional information and clarify understanding.</li> <li>1.3 Follow rules of ethics and protocol established by the organisation.</li> <li>1.4 Treat individuals and groups from different <b>backgrounds, cultures</b> and languages with respect and sensitivity.</li> <li>1.5 Communicate and cooperate with individuals from different <b>backgrounds</b> while carrying out organisational tasks and activities.</li> <li>1.6 Respond to organisational situations in a manner that considers <b>different traditions and ways of communicating</b> and values and respects differences in <b>cultures, language and backgrounds</b>.</li> </ul> |
| 2. Deal with cultural misunderstandings                  | <ul style="list-style-type: none"> <li>2.1 Identify issues which may cause conflict or misunderstandings in the organisation and communicate to relevant persons.</li> <li>2.2 Address difficulties with those involved within the limits of own authority and seek assistance from relevant persons where required.</li> <li>2.3 Work with others to resolve cultural misunderstandings and refer those outside the limits of own authority to appropriate persons.</li> </ul>   |

- 3. Work with others
  - 3.1 Confirm that others know and understand the approved organisational methods of communication, ethics and protocols to be used.
  - 3.2 Conduct work in accordance with the role and responsibilities of assigned tasks.
  - 3.3 Contribute to the achievement of required outcomes, consult with others and participate in activities.
  - 3.4 Collaborate with relevant others to resolve problems through agreed and accepted processes of the organisation.
  - 3.5 Make suggestions for improvements to processes for the achievement of tasks according to organisational procedures.
  - 3.6 Conduct work maintaining personal health, safety and environmental regulations according to organisational procedures and established regulations.

**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Backgrounds, cultures** may include but are not limited to:

- Race/ethnic origin
- Language
- Special needs
- Family structure
- Gender
- Age
- Sexual preference

**2. Different traditions and ways of communicating** may include but are not limited to:

- Appropriate ways of greeting and parting
- Levels of formality
- Work ethics
- Family obligations
- Customs
- Social values
- Dress and grooming
- Non-verbal behaviour, understanding and interpretations
- Observance of special religious feasts or other celebratory days
- Product preferences

**UNDERPINNING KNOWLEDGE AND SKILLS**

*Candidates must know and understand:*

1. What are the approved methods of communication for the organisation.
2. How to demonstrate effective listening skills and the importance of effective listening.
3. Why it is important to ask questions to gain additional information and clarify understanding.
4. What are the rules of ethics and protocols established by the organisation that must be followed.
5. How and why it is important to treat individuals and groups from different backgrounds, cultures and languages with respect and sensitivity.
6. Which methods and techniques to use to communicate and cooperate effectively with individuals from different backgrounds when carrying out organisational tasks and activities.
7. How to value and respect differences in cultures and backgrounds while communicating in organisational situations.
8. How to work with others to resolve misunderstandings, whilst considering cultural differences and refer those outside of limits of own authority to appropriate persons.
9. Why and when to confirm that others know and understand methods of communication, ethics and protocols approved by the organisation.
10. What are your role and responsibilities in assigned tasks according to organisational procedures.
11. What methods to use and how to contribute to the achievement of required outcomes for assigned tasks.
12. How to collaborate with others to resolve problems.
13. What are the agreed and accepted processes of the organisation for resolving problems.
14. What suggestions to make for improvements to processes.
15. Why it is important to make suggestions to improve the achievement of tasks.
16. How to work safely.
17. What are the personal health, safety and environmental regulations that must be maintained for safe work.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

### (2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

### (3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidates must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, products and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **must not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.



**UA50302****Investigate new robotics technologies**

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to investigate new robotics technologies. It focuses on how to research the process and systematically examine the technologies for further use. The unit seeks to encourage learners to maintain currency of knowledge and skills in the occupational area and be innovative.

**ELEMENT****PERFORMANCE CRITERIA**

*Candidates must be able to:*

- |   |   |
|---|---|
| 1. Research new technologies                            | 1.1 Propose and agree on the objectives of the research with relevant persons.  |
|   | 1.2 Use reliable, approved <b>methods</b> to facilitate research.   |
|   | 1.3 Collect and document information according to organisational procedures.  |
| 2. Explore new technologies                             | 2.1 Review documented information collected from approved <b>methods</b> .  |
|   | 2.2 Prioritise documented information using set criteria and document the results according to organisational procedures. |
|   | 2.3 Evaluate new technologies and summarise findings to disseminate to relevant persons.                                  |
|   | 2.4 Incorporate <b>new technologies</b> according to organisational procedures.   |
|   | 2.5 Record and report incorporated <b>new technologies</b> in keeping with organisational procedures.                     |
| 3. Monitor the performance of new robotics technologies | 3.1 Update relevant persons on incorporated <b>new technologies</b> in keeping with organisational procedures.            |
|   | 3.2 Examine incorporated <b>new technologies</b> and record findings in accordance with organisational procedures.        |

- 3.3 Seek feedback from relevant persons on incorporated **new technologies** and make informed decisions to make adjustments and implement recommendations.
- 3.4 Maintain personal health, safety and environmental regulations to minimise risk to self and others during work activities.

**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Methods** may include but are not limited to:

- Online via internet and other search machines
- Manual
- Informal search

**2. New technologies** may include but are not limited to:

- Applications i.e. areas where robots and robotics systems are being used
- Improvements in efficiency and effectiveness
- Safety features

**UNDERPINNING KNOWLEDGE AND SKILLS**

*Candidates must know and understand:*

1. What are the objectives of the research and the approved organisational methods for research.
2. Why it is important to use reliable and research methods approved by the organisation and how to do so.
3. How to carry out research using reliable and approved methods.
4. What are the organisational procedures for the collection and documentation of information.
5. What methods to use in reviewing collected documented information.
6. Which criteria to use in prioritising documented information.
7. How to incorporate new technologies into robotics systems.
8. Which methods to use for the incorporation of new technologies in robots and robotics systems.
9. What information relating to new technologies is relevant and should be shared with relevant persons.
10. How to examine incorporated new technologies.
11. Why it is important to seek feedback from relevant persons.
12. When to adjust and implement recommendations obtained from constructive feedback.
13. How to work safely at all times.
14. What are the personal health, safety and environmental regulations that must be maintained.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

### (2) Method of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

### (3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

## UA50402

## Design robots and robotics systems

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to design robots and robotics systems. It deals with the purpose for designing robots and robotics systems and the evaluation of the design.

**ELEMENT****PERFORMANCE CRITERIA**

*Candidates must be able to:*

- |  |  |
|--|--|
| 1. Prepare for the design process                      | <ul style="list-style-type: none"> <li>1.1 Determine the scope and limits of the design process according to personal and organisational guidelines and requirements.</li> <li>1.2 Obtain design specifications and requirements from relevant persons and reliable sources.</li> <li>1.3 Establish the technologies to be used in the design process according to organisational guidelines.</li> <li>1.4 Confirm the purpose for designing robots and robotics systems with relevant persons.</li> </ul> |
| 2. Confirm the elements of robots and robotics systems | <ul style="list-style-type: none"> <li>2.1 Identify the <b>elements</b> of robots and robotics systems for the design process.</li> <li>2.2 Agree on the criteria and specifications for the <b>elements</b> of robots and robotics systems.</li> <li>2.3 Document agreed criteria and specifications according to organisational procedures.</li> </ul>   |
| 3. Devise robots and robotics systems                  | <ul style="list-style-type: none"> <li>3.1 List the <b>design factors</b> to be considered in the design process.</li> <li>3.2 Analyse and finalise <b>design factors</b> according to conceptual designs.</li> <li>3.3 Produce conceptual designs and document in accordance with personal and organisational procedures.</li> <li>3.4 Present conceptual designs for review and evaluation to relevant persons.</li> </ul>   |

- 4. Evaluate designs
  - 4.1 Choose and confirm the parameters to be used in the evaluation of designs.
  - 4.2 Review designs using the confirmed parameters.
  - 4.3 Document the outcomes from the evaluation of designs according to organisational procedures.
  - 4.4 Implement the next steps after reviewing documented outcomes from the evaluation of designs.
  - 4.5 Adhere to personal health, safety and environmental regulations and best industry practices during work activities.

**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Elements** may include but not limited to:

- Mechanisms for movements
- Electronics and microcontroller systems
- Programming systems
- Fabrication requirements

**2. Design factors** may include but not limited to:

- Environmental i.e. type of terrain - dry, wet, cold etc.
- Power system
- Materials for fabrication
- Health, safety and environmental requirements
- Application of the robots and robotics systems



**UNDERPINNING KNOWLEDGE AND SKILLS**

*Candidates must know and understand:*

1. What are the scope and limits of the design process.
2. Which technologies will be used in the design process.
3. Why it is important to obtain design specifications and requirements from reliable sources.
4. What is the purpose of designing the robots and robotics systems.
5. What are main elements of robots and robotics systems.
6. Why it is important to have a good understanding of circuit systems.
7. Why it is important to have a good understanding of programming.
8. What are the different types of programming languages and which language to use.
9. How to select the type of fabrication suited to robots and robotics systems.
10. What are the factors that must be considered in the design phase.
11. Why it is important to identify the purpose behind the design.
12. How to produce conceptual designs.
13. Why it is important to document conceptual designs.
14. What are the personal health, safety and environmental regulations that should be adhered to for working safely at all times.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

### (2) Method of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation of performance task
- Product of work
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

### (3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

**UA50502****Test and operate robots and robotics systems**

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to test and operate robots and robotics systems. It includes how to conduct pre-start up checks, the correct operation of the robots and robotics systems and how to shut-them them down when completed.

**ELEMENT****PERFORMANCE CRITERIA**

*Candidates must be able to:*

- |   |   |
|---|---|
| 1. Conduct pre-operational checks       | <ul style="list-style-type: none"> <li>1.1 Organise <b>pre-operational checks</b> that must be conducted according to manufacturer's specifications and organisational procedures.</li> <li>1.2 Agree with relevant persons on the recording and reporting procedures that must be followed in keeping with organisational procedures.</li> <li>1.3 Confirm the availability of required equipment, tools and materials for <b>pre-operational checks</b> according to manufacturer's guidelines.</li> <li>1.4 Conduct <b>pre-operational checks</b> and record and report results according to organisational procedures.</li> </ul> |
| 2. Evaluate robots and robotics systems | <ul style="list-style-type: none"> <li>2.1 Review results from <b>pre-operational checks</b> and finalise the next steps for the testing of robots and robotics systems.</li> <li>2.2 Run tests on robots and robotics systems according to manufacturer's guidelines, industry best practices and organisational procedures.</li> <li>2.3 Select and use the appropriate tools and equipment for running tests on robots and robotics systems.</li> <li>2.4 Maintain the required operational specifications for safe testing of robots and robotics systems.</li> </ul>   |

- 2.5 Record the outcomes from tests conducted on robots and robotics systems according to organisational procedures.
- 3. Use robots and robotics systems
  - 3.1 Operate robots and robotics systems to meet task requirements according to manufacturer's guidelines and organisational procedures.
  - 3.2 Monitor the operation of robots and robotics systems during their use and document any issues experienced.
  - 3.3 Adhere to health, safety and environmental regulations and procedures.
  - 3.4 Complete tasks and document results according to organisational procedures.
- 4. Shut-down robots and robotics systems
  - 4.1 Obtain sign-off that tasks were completed according to organisational procedures.
  - 4.2 Shut-down robots and robotics systems in accordance with manufacturer's guidelines and best industry practices.
  - 4.3 Clean and store robots and robotics systems in accordance with manufacturer's guidelines and organisational requirements.

**RANGE STATEMENT**

*All range statements must be assessed:*

1. **Pre-operational checks** may include but are not limited to:
  - Safety
  - Mechanical
  - Electrical
2. **Tests** may include but are not limited to:
  - To confirm:
    - requirements of the task are met
    - requirements of the task are fit for purpose
    - what is functioning correctly
3. **Operational specifications** may include but are not limited to:
  - Speed
  - Range of movements allowed
  - Space

**UNDERPINNING KNOWLEDGE AND SKILLS**

*Candidates must know and understand:*

1. What are the pre-operational checks that must be carried out before using robots and robotics systems and why they are important.
2. How to organise and conduct pre-operational checks.
3. What are the reporting and recording procedures of the organisation and why it is important to agree on these procedures with relevant persons.
4. What is the process for confirming the availability of required equipment, tools and materials for pre-operational checks.
5. How to review the results of pre-operational checks and prepare for the next steps.
6. What are the personal health, safety and environmental regulations that must be adhered to for tasks and the workspace.
7. What are the required tools, equipment and materials to ensure safety of self and others and for safe working when testing and operating robots and robotics systems.
8. Which tests to run and why these are important.
9. How to select and use the appropriate tools and equipment for running tests.
10. Which methods to use to record the results of tests.
11. How to operate robots and robotics systems.
12. How to monitor the operation of robots and robotics systems during their use.
13. Why it is important to document any issues experienced while monitoring the operation of robots and robotics systems.
14. Why it is important to work safely at all times adhering to health, safety and environmental regulations and procedures.
15. How to shut-down, clean and store robots and robotics systems.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

### (2) Method of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation of performance task
- Product of work
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

### (3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

**UA50602****Train others in robotics systems**

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to train others in robotics systems. It involves preparing for and delivering training and providing opportunities for practice to achieve mastery in skills. It also includes how to evaluate training and make improvements from constructive feedback and the outcomes of the evaluation.

**ELEMENT****PERFORMANCE CRITERIA***Candidates must be able to:*

- |    |                      |     |   |
|----|----------------------|-----|---|
| 1. | Prepare for training | 1.1 | Consult with relevant persons to identify training needs and objectives.  |
|    |                      | 1.2 | Confirm and obtain sign-off on training needs and objectives with relevant persons.   |
|    |                      | 1.3 | Identify and confirm that the <b>resources</b> required to support the training needs are available and ready for use.  |
|    |                      | 1.4 | Draft and document training approaches and methods to be used in the training.  |
| 2. | Deliver training     | 2.1 | Select the methods to be used in the delivery of training according to training objectives and <b>characteristics</b> of learners.                              |
|    |                      | 2.2 | Employ strategies and techniques which will facilitate the learning process according to training objectives and <b>characteristics</b> of learners.            |
|    |                      | 2.3 | Provide information to trainees on the objectives of training, sequence and schedule of activities and assessment processes.                                    |
|    |                      | 2.4 | Conduct training in a logical sequence and revise and modify to meet needs of learners as necessary.  |
|    |                      | 2.5 | Provide information during training on the use of correct terminology, design concepts, innovations and new technologies used with robots and robotics systems. |



- 2.6 Provide opportunities for practice to allow learners to improve learning and for mastery of skills and competencies.
  - 2.7 Use various methods and diverse approaches to encourage learning that meets the needs of learners.
  - 2.8 Document training details according to organisational procedures.
  - 2.9 Maintain a safe and comfortable environment during training.
3. Evaluate training
- 3.1 Evaluate training against agreed parameters using **approved evaluation methods** according to organisational procedures.
  - 3.2 Encourage learners to conduct self-evaluation on their performance and identify areas for improvement.
  - 3.3 Document the results of evaluation and present to relevant persons according to organisational requirements.
  - 3.4 Use the results of evaluation to improve and guide further training.

**RANGE STATEMENT**

*All range statements must be assessed:*

1. **Resources** may include but are not limited to:
  - Tools, equipment and materials
  - Learning and teaching resources
  - Human resources
2. **Characteristics of participants** may include but are not limited to:
  - Skills and competencies level
  - Diversity of participants
3. **Approved evaluation methods** may include but are not limited to:
  - Feedback from participants
  - Review of achievement of objectives
  - Reflection by trainer

**UNDERPINNING KNOWLEDGE AND SKILLS**

*Candidates must know and understand:*

1. How to identify training needs through consultation with relevant persons.
2. Why it is important to confirm and sign-off on training needs and objectives from relevant persons.
3. Which methods to use to identify and confirm the required resources for training.
4. What are the training approaches and methods that will be used in training.
5. What are the strategies and techniques that can be employed to facilitate the learning process.
6. How to and why it is important to provide learners with information relating to the objectives, sequence of activities and assessment process.
7. How to conduct training using a systematic approach and what is the importance of revising and modifying the approach as necessary.
8. Why it is important to provide opportunities for practice to allow learners to improve their learning and for mastery of skills and competencies and how to do so.
9. How and why it is important to document training.
10. What are the approved methods and techniques to be used in the evaluation process.
11. What is the importance of self-evaluation and how it is conducted.
12. Why it is important to document the results of the evaluation.
13. How to use the results from the evaluation to improve and guide further training.
14. What is the correct terminology to be used for robots and robotics systems.
15. What are the design concepts that should be included in training.
16. Why it is important to include innovations and new technologies in training on robots and robotics systems.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

### (2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

### (3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidates must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, products and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **must not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

**UA50702****Incorporate computer technology in robotics systems**

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to incorporate computer technology into robotics systems. It covers preparing for and incorporating computer technology and the associated monitoring and maintenance activities.

**ELEMENT****PERFORMANCE CRITERIA**

*Candidates must be able to:*

- |                                     |   |
|-------------------------------------|---|
| 1. Select computer technology       | <ul style="list-style-type: none"> <li>1.1 Consult with relevant persons on the requirements of assigned tasks according to organisational procedures.</li> <li>1.2 Analyse task requirements to identify what computer technology is required.</li> <li>1.3 Select appropriate <b>computer technology</b> to achieve task requirements.</li> <li>1.4 Confirm with relevant persons, that selected computer technology is approved for use according to organisational procedures.</li> </ul>   |
| 2. Integrate computer technology    | <ul style="list-style-type: none"> <li>2.1 Carry out pre-operational checks on selected computer technology according to manufacturer's guidelines and industry best practices.</li> <li>2.2 Incorporate computer technology according to task requirements following manufacturer's guidelines and industry best practices.</li> <li>2.3 Review and test incorporated computer technology and adjust to ensure task requirements are being met.</li> <li>2.4 Seek feedback on the effectiveness of incorporated computer technology and use or include feedback as appropriate.</li> </ul> |
| 3. Maintain incorporated technology | <ul style="list-style-type: none"> <li>3.1 Monitor incorporated computer technology according to manufacturer's guidelines and industry best practices.</li> </ul>  |

- 3.2 Maintain incorporated computer technology and record the results of monitoring and maintenance according to organisational procedures.
- 3.3 Maintain personal health and safety and organisational and environmental regulations while conducting work activities.
- 3.4 Report and record relevant information according to organisational procedures.

**RANGE STATEMENT**

*All range statements must be assessed:*

1. **Computer technology** may include but is not limited to:
  - Artificial Intelligence (AI)
  - Robotic process automation
  - Internet of Things (IoT)

**UNDERPINNING KNOWLEDGE AND SKILLS**

*Candidates must know and understand:*

1. How and why it is important to consult with relevant persons on the requirements of tasks.
2. How to analyse task requirements to identify what computer technology is required.
3. What are different types of computer technology and how to select that which meets the requirements of tasks.
4. What methods are used to obtain approval for the use of selected computer technology.
5. What are the pre-operational checks for selected computer technology and the associated manufacturer's guidelines and best industry practices.
6. How and why it is important to carry out pre-operational checks for selected computer technology.
7. How to incorporate computer technology according to task requirements using manufacturer's guidelines and best industry practices.
8. What criteria to use for reviewing incorporated technology.
9. How to test and adjust incorporated computer technology to ensure task requirements are being met.
10. Which methods to use in seeking feedback on the effectiveness of incorporated computer technology and how to use or include feedback as appropriate.
11. Which methods to use in monitoring incorporated computer technology according to manufacturer's guidelines and best industry practices.
12. How to monitor and maintain incorporated computer technology.
13. What are the reporting and recording of organisational procedures.
14. What are the personal health, safety and environmental regulations and organisational requirements that must be maintained to ensure safe working activities.



## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

### (2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

### (3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidates must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, products and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **must not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

**UA50802****Operate a smart device**

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to operate a smart device. A smart device is defined as an electronic gadget that can connect, share and interact with its user and other smart devices. They are connected via different protocols such as WiFi, Bluetooth and G3 and can operate to an extent, interactively and autonomously. These smart devices are external devices.

**ELEMENT****PERFORMANCE CRITERIA***Candidates must be able to:*

- |    |                    |  |
|----|--------------------|--|
| 1. | Start smart device | 1.1 Identify and select <b>smart devices</b> to be used according to organisational procedures and tasks.                          |
|    |                    | 1.2 Conduct pre-operational checks as required according to manufacturer's guidelines.   |
|    |                    | 1.3 Report the results of pre-operational checks and obtain sign-off from relevant persons according to organisational procedures. |
|    |                    | 1.4 Confirm task requirements in accordance with organisational procedures.  |
| 2. | Use smart device   | 2.1 Inspect and confirm that smart devices are ready for use according to manufacturers' guidelines and operational procedures.    |
|    |                    | 2.2 Maintain personal health and safety and organisational and environmental regulations for the safe operation of smart devices.  |
|    |                    | 2.3 Operate smart devices to satisfy task requirements according to manufacturers' guidelines.                                     |
|    |                    | 2.4 Monitor smart devices while in operation and record any problems experienced according to organisational procedures.           |

- 2.5 Resolve problems within the limits of own authority and refer those problems outside of own limits to relevant persons.
  - 2.6 Operate smart devices to complete tasks in accordance with manufacturers' guidelines and organisational procedures.
- 3. Shut-down smart device
  - 3.1 Report and obtain feedback from relevant persons on the completion of tasks according to organisational procedures.
  - 3.2 Agree that the shut-down of smart devices can take place with relevant persons.
  - 3.3 Shut-down smart devices according to manufacturers' guidelines.
  - 3.4 Document information in accordance with organisational procedures.
  - 3.5 Maintain personal health, safety and environmental regulations during work operations.

**RANGE STATEMENT**

*All range statements must be assessed:*

No range items

**UNDERPINNING KNOWLEDGE AND SKILLS**

*Candidates must know and understand:*

1. What are smart devices and the importance of their use.
2. What are the manufacturer's guidelines for pre-operational checks on smart devices.
3. How to report on pre-operational checks and why it is important to obtain sign-off from relevant persons.
4. Which methods to use for inspection and to confirm that smart devices are ready for use.
5. What are the personal health, safety and environmental regulations that must be maintained for the safe use of smart devices.
6. How to operate smart devices safely and use them to complete tasks.
7. Why it is important to monitor smart devices during their operation.
8. What methods to use in resolving problems within the limits of own authority.
9. When to report and obtain feedback from relevant persons on the completion of tasks using smart devices.
10. When to shut-down smart devices and what are the manufacturer's guidelines for doing so.
11. What are the main categories of smart devices and their different operating systems.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

### (2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

### (3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidates must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, products and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **must not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

**UA50902****Use intermediate coding to programme robots**

## Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to use intermediate coding skills to programme robots to achieve specific tasks. It includes using block-based coding on robotics software to solve compound problems.

Candidates are expected to demonstrate knowledge of the specific robotics software being used and be able to work alone or as a member of a team or group to achieve task requirements.

**ELEMENT****PERFORMANCE CRITERIA**

*Candidates must be able to:*

- |   |   |
|---|---|
| 1. Confirm task requirements            | <ul style="list-style-type: none"> <li>1.1 Obtain task requirements from relevant persons according to the organisational procedures.</li> <li>1.2 Confirm that task requirements are within the scope of own competencies and level of authority.</li> <li>1.3 Agree on the reporting and recording procedures and sign-off on task requirements with relevant persons.</li> </ul>   |
| 2. Build code to meet task requirements | <ul style="list-style-type: none"> <li>2.1 Identify and select the relevant blocks required to complete the assigned task.</li> <li>2.2 Build code with the required blocks that will meet the task requirements using <b>intermediate coding skills</b>.</li> <li>2.3 Present code to relevant persons and obtain feedback in accordance with organisational procedures.</li> <li>2.4 Record the code in accordance with organisational procedures.</li> </ul> |
| 3. Run and check code                   | <ul style="list-style-type: none"> <li>3.1 Turn on the robot, load and run code in accordance with manufacturer's guidelines.</li> <li>3.2 Define <b>robot component</b> functions and abilities to meet task requirements.</li> </ul>  |

- 3.3 Execute the code and identify and respond to **prompts** in accordance with organisational procedures and manufacturer's guidelines.
- 3.4 Perform troubleshooting processes, where required, in accordance with organisational procedures and manufacturer's guidelines.
- 3.5 Operate robot and monitor performance to test, prove and adjust the code to meet task requirements.
- 3.6 Save the code when task requirements are satisfied in accordance with organisational procedures.
- 3.7 Report and record the results of programme performance according to organisational procedures.
- 3.8 Obtain sign-off and shut-down the robot according to manufacturer's guidelines and organisational procedures.
- 3.9 Comply with personal, health, safety and environmental regulations and guidelines.



**RANGE STATEMENT**

*All range statements must be assessed:*

1. **Intermediate coding skills** may include but are not limited to:
  - Order of blocks to form scripts
  - Association (i.e. using compatible blocks)
  - Manipulating parameters in blocks
  - Iteration (i.e. test and modify scripts)
  - Conditionals
2. **Robot components** may include but are not limited to:
  - Mobility/locomotion (e.g. wheels, legs, propellers, fins)
  - Motors
  - Sensors (e.g. proximity, orientation, heat, sound, vision, touch, etc.)
  - Manipulators/effectors (e.g. pushers, claws, grippers, mechanical arms, etc.)
3. **Prompts** may include but are not limited to:
  - Error messages
  - Firmware update
  - Battery life
  - Faults

**UNDERPINNING KNOWLEDGE AND SKILLS**

*Candidates must know and understand:*

1. What are the task requirements, how to obtain them from relevant persons and what are the organisational procedures for doing so.
2. Why it is important to confirm that task requirements are within the scope of own competencies and level of authority.
3. Why it is important to agree on the reporting and recording procedures.
4. How to obtain sign-off and feedback on tasks from relevant persons and why this is important.
5. How to define the following key terms:
  - code
  - script
  - blocks
  - iteration
  - conditionals
  - parameters
  - robot
6. How to identify, select and order blocks to build a script to accomplish a specific task.
7. How to turn on a robot, load and run the code to meet the task requirements.
8. How to perform troubleshooting on a robot.
9. Why a robot requires instructions to carry out functions.
10. Why it is important to define the functions and abilities of a robot's components when building code to meet task requirements and how to do so.
11. How to incorporate computational concepts when building code to meet task requirements.
12. What are the relevant prompts that may be encountered when running code on a robot and what are the manufacturer's guidelines for identifying them.
13. How to respond to prompts on a robot and what are the organisational procedures and manufacturer's guidelines for doing so.
14. How to operate a robot and monitor its performance when the code is being run.
15. How to test, prove and adjust the code used to programme a robot to meet task requirements.
16. How to save the code used to programme a robot and what are the organisational procedures for doing so.
17. How to shut-down a robot and what are the relevant manufacturer's guidelines and organisational procedures for doing so.
18. How to comply with relevant personal, health, safety and environmental regulations and guidelines for doing so.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real working environment.

### (2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

### (3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidates must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, products and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **must not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

**Assessment methods**

The methods which can be used to determine competence in performance and underpinning knowledge.

**Assessors**

The Assessor guides and assesses the candidate. His/her role is to determine whether evidence presented by a candidate for assessment within the programme meets the required standard of competence in the relevant unit or element. The Assessor needs to be competent to assess to national standards in the area under assessment.

**Approved Centre**

Organisation/Centre approved by the TVET Council to offer full National Vocational Qualifications.

**Case Studies**

In situations where it is difficult for workplace assessment to take place, case studies can offer the candidate an opportunity to demonstrate potential competence.

A case study is a description of an actual or imaginary situation presented in some detail. The way the case study is presented will vary depending upon the qualification, but the most usual methods are written, taped or filmed.

The main advantage of a case study is the amount of evidence of underpinning knowledge they can generate and the specific nature of the evidence produced.

**Competence**

In the context of vocational qualifications, competence means: the ability to carry out prescribed activities to nationally pre-determined standards in an occupation. The definition embraces cognitive, practical and behavioural skills, underpinning knowledge and understanding and the ability to react appropriately in contingency situations.

**Element**

An element is a description of an activity which a person should be able to do. It is a description of an action, behaviour or outcome which a person should be able to demonstrate.

**Explanation of NVQ Levels**

NVQs cover five (5) levels of competence, from entry level staff at Level 1 through to senior management at Level 5.

**Level 1 - Entry Level**

Recognises competence in a range of varied work activities performed in a variety of contexts. Most work activities are simple and routine. Collaboration with others through work groups or teams may often be a requirement. Substantial supervision is required especially during the early months evolving into more autonomy with time.

**Level 2 - Skilled Occupations**

Recognises competence in a broad range of diverse work activities performed in a variety of contexts. Some of these may be complex and non-routine and involve some responsibility and autonomy. Collaboration with others through work groups or teams and guidance of others may be required.

**Level 3 - Technician and Supervisory Occupations**

Recognises competence in a broad range of complex, technical or professional work activities performed in a wide variety of contexts, with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and the allocation of resources are often a requirement. The individual is capable of self-directed application, exhibits problem solving, planning, designing and supervisory capabilities.

**Level 4 - Technical Specialist and Middle Management Occupations**

Recognises competence involving the application of a range of fundamental principles and complex techniques across a wide and unpredictable variety of contexts. Requires very substantial personal autonomy and often significant responsibility for the work of others, the allocation of resources, as well as personal accountability for analysis, diagnosis, design, planning, execution and evaluation.

**Level 5 - Chartered, Professional and Senior Management Occupations**

Recognises the ability to exercise personal professional responsibility for the design, development or improvement of a product, process, system or service. Recognises technical and management competencies at the highest level and includes those who have occupied positions of the highest responsibility and made outstanding contribution to the promotion and practice of their occupation.

**External Verifier**

The External Verifier is trained and appointed by the TVET Council and is competent to approve and ensure an approved Centre's quality of provision.

**Internal Verifier**

The Internal Verifier acts in a supporting role for Assessors to ensure consistent quality of assessment and competence. They need to be competent to assess to national standards in the area under assessment.

**NVQ**

National Vocational Qualifications (NVQs) are work-based qualifications that assess an individual's competence in a work situation and certify that the individual can perform the work role to the standards expected in employment.

NVQs are based on national occupational standards of competence drawn up by standards-setting bodies known as Industry Lead Bodies. The standards describe the level and breadth of performance that is expected of persons working in the industry or sector which the NVQ covers.

**NVQ Coordinator**

The NVQ Coordinator is the centre contact within each approved Centre offering NVQs. He/she has overall responsibility for the operation and administration of the NVQ system

**Observation**

Observation of the candidate carrying out his/her job in the workplace is the assessment method recommended in the vast majority of units and elements. Observation of staff carrying out their duties is something that most supervisors and managers do every day.

**Performance Criteria**

Performance criteria indicate what is required for the successful achievement of an element. They are descriptions of what you would expect to see in competent performance.

**Product of Work**

This could be items produced during the normal course of work which can be used for evidence purposes such as reports, menus, promotional literature, training plans, etc.

### Questioning

Questioning is one of the most appropriate ways to collect evidence to assess a candidate's underpinning knowledge and understanding.

Questioning can also be used to assess a candidate in those areas of work listed in the range which cannot be assessed by observation. Guidance on when this assessment method can be used is given in the assessment guidance of each individual element.

As an assessment method, questioning ensures you have all of the evidence about a candidate's performance. It also allows you to clarify situations.

### Range statements

The range puts the element of competence into context. A range statement is a description of the range of situations to which an element and its performance criteria is intended to apply.

Range statements are prescriptive; therefore each category must be assessed.

### Role-plays

Role-plays are simulations where the candidate is asked to act out a situation in the way he/she considers "real" people would behave. By using role-play situations to assess a candidate you are able to collect evidence and make a judgment about how the candidate is most likely to perform. This may be necessary if the range specified includes a situation in which the candidate is unlikely to find himself/herself in the normal course of their work, or where the candidate needs to develop competence before being judged competently, for example, in a disciplinary situation,

### Simulations

Where possible, assessment should always be carried out by observing **natural performance** in the workplace. **Simulated performance**, however, can be used where specified to collect evidence about an aspect of the candidate's work which occurs infrequently or is potentially hazardous, for example, dealing with fires.

By designing the simulated situation, briefing the candidate and observing his/her performance, you will be able to elicit evidence which will help you judge how a candidate is **most likely** to perform in real life.

### Supplementary evidence

Supplementary evidence can be used to confirm and support performance evidence. Types of supplementary evidence include witness testimonies, reports, journals or diaries, records of activities, personal statements, simulation (see note in glossary).

### Underpinning knowledge

Underpinning knowledge indicates what knowledge is essential for a person to possess in order to successfully achieve an element and prove total competence.

### Units

A unit of competence describes one or more activities which form a significant part of an individual's work. Units are accredited separately but in combination can make up a vocational qualification. There are three categories of units:

**Mandatory units** - are core to a qualification and must be completed.

**Optional units** - candidates must choose the required number of individual units, specified in the qualification structure, to achieve the qualification.

### Work-based projects

Work-based projects are a useful way for you to collect evidence to support any decision you make about a candidate's performance. They are particularly appropriate in determining the level of a candidate's underpinning knowledge and understanding where it may be insufficient to rely only on questioning observation.

A project often involves the identification of a solution to a specific problem identified by you and/or the candidate (such as looking at ways to redress a recent drop in sales), or may be a structured programme of work built around a central situation or idea (such as the introduction of a new job rostering process)