



REPUBLIC OF KENYA

NATIONAL OCCUPATIONAL STANDARDS

FOR

AGRICULTURAL ENGINEERING TECHNICIAN

LEVEL 6

PROGRAMME ISCED CODE: 0716 454 A



TVET CDACC
P.O. BOX 15745-00100
NAIROBI

APPLY ENGINEERING MATHEMATICS

UNIT CODE: 0541 541 16A

TVET CDACC CODE: ENG/OS/AGR/CC/01/6/MA

UNIT DESCRIPTION

This unit describes the competences required in order to apply engineering mathematics. It enables the learner to; Apply complex numbers, perform coordinates geometry, carry out binomial expansion, apply calculus, apply vector theorem and Apply matrices.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements. <i>(Bold and italicised terms are elaborated in the Range)</i>
1. Apply complex numbers	1.1 Complex numbers are represented on Argand diagrams as per job requirement 1.2 <i>Operations</i> involving complex numbers are performed as per job requirement 1.3 De Moivre's theorem is applied as per as per job requirement
2. Perform coordinates geometry	2.1 Polar equations are solved as per job requirement 2.2 Polar equations graphs are drawn as per job requirement 2.3 Normal and tangents are determined as per job requirement
3. Carry out binomial expansion	3.1 Binomial series is determined as per as per job requirement 3.2 Roots of numbers are determined as per job requirement 3.3 Errors of small changes are determined as per job requirement

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These are assessable statements which specify the required level of performance for each of the elements. <i>(Bold and italicised terms are elaborated in the Range)</i>
4. Apply calculus	4.1 Derivatives of functions are determined as per job requirement 4.2 Differentiation is applied as per job requirement 4.3 Integrals of functions are determined as per job requirement 4.4 Integration is applied as per job requirement
5. Apply vector theorem	5.1 Vectors and scalar quantities are defined as per job requirement 5.2 Operations on vectors are performed as per job requirement 5.3 Position vectors are determined as per as per job requirement 5.4 Resolution of vectors is performed as per job requirement 5.5 Vector and scalar products are obtained as per job requirement
6. Apply matrices	6.1 Matrices operations are performed as per job requirement 6.2 Inverse of matrices are obtained as per job requirement 6.3 Simultaneous equations are solved using matrices as per job requirement

RANGE

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

Variable	Range
1. Operations may include but not limited to:	1.1 Addition 1.2 Subtraction 1.3 Multiplication 1.4 Division
2. binomial expansion	2.1 Powers 2.2 Coefficients 2.3 Pascals triangle 2.4 Expansion 2.5 Binomial theorem 2.6 Positive powers of n 2.7 Negative powers of n 2.8 Fractional powers of n (roots)
3. calculus	3.1 Power 3.2 Product 3.3 Chain 3.4 Quotient
4. vector theorem	4.1 Dot product 4.2 Cross product 4.3 Resolution of vectors 4.4 Analysis 4.5 Graphical Methods 4.6 Triangle theorem 4.7 Parallel theorem 4.8 Polygon theorem

REQUIRED KNOWLEDGE AND UNDERSTANDING

This section describes the skills and knowledge required for this unit of competency.

Required Skills

The individual needs to demonstrate the following skills:

- Applying fundamental operations (addition, subtraction, division, multiplication)

- Using and applying mathematical formulas
- Logical thinking
- Problem solving
- Applying statistics
- Drawing graphs
- Using different measuring tools

Required Knowledge

The individual needs to demonstrate knowledge and understanding of:

- Basic calculus
- Geometry
- Fundamental operations (addition, subtraction, division, multiplication)
- Calculating area and volume
- Rounding techniques
- Types of fractions
- Types of tables and graphs
- Presentation of data in tables and graphs
- Vector operations
- Matrix operations

EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <p>1.1 Applied complex numbers as per job requirement</p> <p>1.2 Applied coordinates geometry as per job requirement</p> <p>1.3 Applied calculus as per job requirement</p> <p>1.4 Carried out binomial expansion as per job requirement</p> <p>1.5 Applied vector as per job requirement</p> <p>1.6 Applied matrices as per job requirement</p>
2. Resource implications	The following resources should be provided:

	<p>2.1 Access to relevant workplace where assessment can take place</p> <p>2.2 Appropriately simulated environment where assessment can take place</p> <p>2.3 Resources relevant to carrying out the tasks required</p>
3. Methods of assessment	<p>Competency may be assessed through:</p> <p>3.1 Written tests</p> <p>3.2 Third party report</p> <p>3.3 Portfolio of evidence</p>
4. Context of assessment	<p>Competency may be assessed:</p> <p>4.1 At the workplace</p> <p>4.2 In a simulated work environment</p>
5. Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>