REPUBLIC OF KENYA

COMPETENCY BASED CURRICULUM

FOR

ELECTRICAL OPERATION (POWER OPTION)

KNQF LEVEL 5

ISCED CODE: 07130554 B

TVET CDACC
P.O BOX 15745-00100
NAIROBI

ENGINEERING MATHEMATICS

UNIT CODE: ENG/CU/PO/CC/01/5/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Apply Engineering mathematics

Duration of Unit: 60 hours

Unit Description

This unit describes the competencies required by an Electrical Technician to apply a wide range of Engineering mathematics in their work. This includes; applying algebraic functions, application of trigonometry and hyperbolic functions, applying complex numbers, coordinate geometry, carrying out binomial expansion, calculus, statistics, vector theory, matrix and numerical methods in solving problems, probability, commercial calculations, performing estimations, measurements and calculation of quantities.

Summary of Learning Outcomes

1. Apply Algebra
2. Apply Trigonometry and hyperbolic functions
3. Apply complex numbers
4. Apply Coordinate Geometry
5. Carry out Binomial Expansion
6. Apply Calculus
7. Apply Statistics
8. Apply Vector theory
9. Apply Matrix
10. Apply Numerical methods
11. Apply concept of probability for work
12. Perform commercial calculations
13. Perform Estimations, Measurements and calculations of quantities

Learning Outcomes, Content and Suggested Assessment Methods

Electrical Curriculum		
Learning Outcome	**Content**	**Suggested Assessment Methods**

1. Apply Algebra	• Base and Index • Law of indices • Indicial equations • Laws of logarithm • Logarithmic equations • Conversion of bases • Use of calculator • Reduction of equations • Solution of equations reduced to quadratic form • Solutions of simultaneous linear equations in three unknowns • Solutions of problems involving AP and GP	• Written tests • Oral questioning • Assignments • Supervised exercises
2. Apply Trigonometry and hyperbolic functions	• Half -angle formula • Factor formula • Trigonometric functions • Parametric equations • Relative and absolute measures • Measures calculation • Meaning of hyperbolic equations • Properties of hyperbolic functions • Evaluations of hyperbolic functions Hyperbolic identities • Osborne's Rule • Ashx+bshx=C equation	• Written tests • Oral questioning • Assignments • Supervised exercises

3. Apply complex numbers	• Meaning of complex numbers • Stating complex numbers in numbers in terms of conjugate argument and • Modulus • Representation of complex numbers on the Argand diagram • Arithmetic operation of complex numbers Application of De Moivre's theorem • Application of complex numbers to engineering	• Assignments • Oral questioning • Supervised exercises • Written tests
4. Apply Coordinate Geometry	• Polar equations • Cartesian equation • Graphs of polar equations • Normal and tangents • Definition of a point • Locus of a point in relation to a circle • Loci of points for given mechanism	• Written tests • Oral questioning • Assignments • Supervised exercises
5. Carry out Binomial Expansion	• Binomial theorem Power series using binomial theorem Roots of numbers using binomial theorem. • Estimation of errors of small changes using binomial theorem.	• Written tests • Oral questioning • Assignments • Supervised exercises

6. Apply Calculus	• Meaning of derivatives of a function • Differentiation from first principle • Tables of some common derivatives • Rules of differentiation • Rate of change and small change • Stationery points of functions of two variables • Meaning of integration • Indefinite and definite integral • Methods of integration application of integration. • Integrals of hyperbolic and inverse functions	• Written tests • Oral questioning • Assignments • Supervised exercises
7. Apply Statistics	• Classification of data • Grouped data • Ungrouped data • Data collection • Tabulation of data • Class intervals • Class boundaries • Frequency tables • Diagrammatic and graphical presentation of data e.g. • Histograms • Frequency polygons • Bar charts • Pie charts • Cumulative frequency curves • Measures of central tendency mean, mode and median • Measures of dispersion	• Assignments • Oral questioning • Supervised exercises • Written tests • Simulation • Data modelling

	• Variance and standard deviation • Definition of probability • Laws of probability • Expectation variance and S.D. • Types of distributions • Mean, variance and SD of probability distributions • Application of probability distributions	
8. Apply Vector theory	• Definition of dot and cross product of vectors • Solution of problems involving dot and cross production of cross • Definition of operators • Definition of vector field • Solutions of problems involving vector fields • Definition of Gradient, Divergence and curl • Solutions of involving Gradient, Divergence and curl • Application of vectors	• Assignments • Oral questioning • Supervised exercises • Written tests
9. Apply Matrix methods	• Matrix operation • Determinant of 3x3 matrix • Inverse of 3x3 matrix • Solutions of linear simultaneous equations in 3 unknowns • Application of matrices	• Assignments • Oral questioning • Supervised exercises • Written tests
10. Apply Numerical methods	• Meaning of interpolation and extrapolation • Application of interpolation • Application of interactive methods to solve equations	• Assignments • Oral questioning • Supervised exercises • Written tests

	• Application of interactive methods to areas and volumes	
11. Apply concepts of probability in work	• Meaning of probability • Types of probability events • Dependent • Independent • Mutually exclusive • Laws of probability • Counting techniques • Permutation • Combination • Tree diagrams • Venn diagrams	• Written tests • Assignments • Supervised exercises
12. Perform commercial calculations	• Product pricing • Average sales determination • Stock turnover • Calculation of incomes • Profit and loss calculations • Salaries • Gross • Net • Wages • Time rate • Flat rate • Overtime • Piece rate • Commission • Percentage • Bonus • Conversion of one currency to another • Exchange rates calculation • Devaluation • Revaluation	• Oral questioning • Written tests • Assignments • Supervised exercises
13. Perform estimations, measurements and	• Units of measurements and their symbols	• Assignments • Oral questioning • Practical tests

calculations of quantities	• Conversion of units of measurement • Calculation of length, width, height, perimeter, area and angles of figures • Measuring tools and equipment • Performing measurements and estimations of quantities	• Observation • Supervised exercises • Written tests

Suggested Methods of Instruction

- Group discussions
- Demonstration by trainer
- Exercises by trainee

Recommended Resources

- Scientific Calculators
- Rulers, pencils, erasers
- Charts with presentations of data
- Graph books
- Dice
- Computers with internet connection