

APPLY MATHEMATICS FOR STATISTICS

UNIT CODE: MATH/OS/AS/CC/01/6/A

UNIT DESCRIPTION:

This unit describes the competencies required by a technician in order to apply algebra apply trigonometry and hyperbolic functions, apply complex numbers, apply coordinate geometry, carry out binomial expansion, apply calculus, solve ordinary differential equations, apply power series, apply statistics, apply numerical methods, apply vector theory, apply matrix and apply quantitative techniques.

ELEMENTS AND PERFORMANCE CRITERIA

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 italicized terms are elaborated in the Range.</i>
1. Apply Algebra	1.1 Calculations involving Indices are performed as per the concept 1.2 Calculations involving Logarithms are performed as per the concept 1.3 Scientific calculator is used in solving mathematical problems in line with manufacturer’s manual 1.4 Solution to system of linear equations involving three unknowns are performed as per the rules and procedure. 1.5 Calculations involving quadratic equations are performed as per the concept. 1.6 Calculations involving sequence and series are performed as per the concept
2. Apply Trigonometry and hyperbolic functions	2.1 Calculations are performed using trigonometric rules 2.2 Calculations are performed using hyperbolic functions 2.3 Calculations involving One-to-one relationship in functions are performed 2.4 Calculations involving applications of trigonometry to obtain area and perimeter of shapes and solids are performed 2.5 Calculations involving hyperbolic identities are performed

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3. Apply complex numbers	3.1 Complex numbers are represented using Argand diagrams 3.2 Operations involving complex numbers are performed 3.3 Calculations involving complex numbers are performed using De Moivre's theorem 3.4 Calculations involving conjugate argument and Modulus are performed as per procedure
4. Apply Coordinate Geometry	4.1 Polar equations are calculated using coordinate geometry 4.2 Graphs of given polar equations are drawn using the Cartesian plane 4.3 Normal and tangents are determined using coordinate geometry
5. Carry out Binomial Expansion	5.1 Roots of numbers are determined using binomial theorem 5.2 Errors of small changes are estimated using binomial theorem 5.3 Calculation involving Power series using binomial theorem is performed as per the procedures
6. Apply Calculus	6.1 Derivatives of functions are determined using Differentiation 6.2 Derivatives of hyperbolic functions are determined using Differentiation 6.3 Derivatives of inverse trigonometric functions are determined using Differentiation 6.4 Rate of change and small change are determined using Differentiation. 6.5 Calculation involving stationery points of functions of two variables are performed using differentiation. 6.6 Integrals of algebraic functions are determined using integration 6.7 Integrals of trigonometric functions are determined using integration

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	6.8 Integrals of logarithmic functions are determined using integration 6.9 Integrals of hyperbolic and inverse functions are determined using integration
7. Solve Ordinary differential equations	7.1 First order and second order differential equations are solved using the method of undetermined coefficients 7.2 First order and second order differential equations are solved from given boundary conditions
8. Apply Power Series	8.1 Power series are obtained using Taylor's Theorem 8.2 Power series are obtained using McLaurin's 's theorem
9. Apply Numerical methods	9.1 Roots of polynomials are obtained using iterative <i>numerical methods</i> 9.2 Interpolation and extrapolation are performed using numerical methods
10. Apply Vector theory	10.1 Vectors and scalar quantities are obtained in two and three dimensions 10.2 Operations on vectors are performed 10.3 Position of vectors is obtained 10.4 Resolution of vectors is done
11. Apply Matrix	11.1 Determinant and inverse of 3x3 matrix are obtained as per the method 11.2 Solutions of simultaneous equations in three unknowns are obtained as per the procedure 11.3 Calculation involving Eigen values and Eigen vectors are performed

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12. Apply quantitative techniques	12.1 The constraints are expressed in Standard Form as per the procedure 12.2 The Slack Variables are determined as per the procedure 12.3 The Tableau is drawn and the coefficients and the constraints indicated as per the procedure 12.4 Optimality Check is performed as per the procedure 12.5 The Pivot Variable is Identified as per the optimality results 12.6 The optimum solution is obtained as per the procedure

RANGE

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

Variable	Range
1 Operations may include but not limited to:	<ul style="list-style-type: none"> • Addition • Subtraction
2 Hyperbolic functions may include but not limited to:	<ul style="list-style-type: none"> • Sinh x • Cosh x • Cosec x • Coth x • Tanh x • Sech x
3 Numerical Methods may include but not limited to:	<ul style="list-style-type: none"> • Newton Raphson • Gregory Newton

REQUIRED SKILLS AND KNOWLEDGE

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 of:

- Fundamental operations (addition, subtraction, division, multiplication)
- Calculating area and volume
- Types and purpose of measuring instruments
- Units of measurement and abbreviations
- Rounding techniques
- Types of fractions
- Types of tables and graphs
- Presentation of data in tables and graphs
- Vector operations
- Matrix operations
- Statistics
- Simplex method

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EVIDENCE GUIDE

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

<p>1. Critical aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Applied Trigonometry and hyperbolic functions 1.2 Applied complex numbers 1.3 Applied Calculus 1.4 Solved Ordinary differential equations 1.5 Applied Power Series 1.6 Applied Vector theory 1.7 Applied Matrix in solving system of linear equations 1.8 Applied Numerical methods 1.9 Apply simplex method in solving linear programming problems
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2. Resource Implications	The following resources should be provided: Access to relevant workplace or appropriately simulated environment where assessment can take place 2.1 Measuring equipment 2.2 Materials relevant to the proposed activity or tasks
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Practical Tests 3.2 Oral Questioning 3.3 Written tests
4. Context of Assessment	Competency may be assessed 4.1 On –Job 4.2 Off- Job 4.3 During Industrial Attachment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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