### 15.2.0 MATHEMATICS II

### 15.2.01 INTRODUCTION

This module unit is intended to equip the trainee with relevant mathematical knowledge, skills and attitudes to enhance better understanding of specialised areas of the trade.

## 15.2.02 GENERAL OBJECTIVES

By the end of the module unit, the trainee should be able to:

- a) Understand mathematical concepts relevant to area of specialization
- b) Apply mathematical concepts to solve problems
- c) Appreciate mathematics as a tool for technological development

# 15.2.0 MODULE UNIT SUMMARY AND TIME ALLOCATION

### **MATHEMATICS II**

<b>6</b> 1	MATHEMATICS	0-1	- T-
Code	Sub Module	Content	Time
	Unit		Hrs
15.2.1	Algebra	Simultaneous equations	10
		<ul> <li>Quadratic equations</li> </ul>	
		Binomial theorem	
15.2.2	Trigonometry	Trigonometric ratios	18
	and Hyperbolic	Factor formulae	
	Functions	<ul> <li>Solution of triangles</li> </ul>	
		• Trigonometric equations	
		Hyperbolic functions	
15.2.3	Vector	<ul> <li>Vector algebra and</li> </ul>	12
		• theorems	
		<ul> <li>Dot and cross products</li> </ul>	
		Gradient, divergence	
		<ul> <li>and curl of scalar</li> </ul>	
		and	
		<ul> <li>vector functions</li> </ul>	
15.2.4	Matrices II	<ul> <li>Matrix operations</li> </ul>	14

		<ul> <li>Determinants</li> <li>Cofactor</li> <li>Crammer's rule</li> <li>Inverse of 3x3 matrix</li> <li>Solution of simultaneous equations</li> </ul>	
15.2.5	Calculus	<ul><li>Differentiation and its</li><li>applications</li><li>Integration</li></ul>	12
Total T	ime	•	66

15.2.1	ALGEBRA		theorem to estimate errors of small
15.2.1T0	Specific Objectives		changes
	By the end of the		
	sub module unit, the	~	Content
	trainee should be	15.2.1T1	Solution of linear
	able to:	x C	simultaneous
	a) solve linear	100	equations
	simultaneous	15.2.1T 2	Reduction of
	equations		equations to
	b) reduce equations		quadratic equations
	to	15.2.1T 3	Solution of
	quadratic		equations reduced to
	equations		quadratic equations
	c) solve quadratic	15.2.1T 4	Statement and use of
	equations		binomial theorem
	d) state and use the	15.2.1T 5	Application of
	binomial theorem		binomial theorem to
	e) apply binomial		estimate errors
	theorem to		
	estimate errors of	15.2.2	TRIGONOMETRY
	small changes		AND
1			HYPERBOLIC
15.2.1C	Competence		<b>FUNCTIONS</b>
	The trainee should	15.0.000	g :c o1: .:
	have the ability to	15.2.2T0	Specific Objectives
	apply binomial		By the end of the sub-module unit, the

	trainee should be		Application
	able to:		
	a) define	15.2.3T	VECTOR
	trigonometrical		
	ratios, compound	15.2.3T0	Specific Objectives
	angles, double		By the end of the
	angles and factor		sub-module unit, the
	formulae		trainee should be
	b) solve right angled		able to:
	c) triangular		a) define a vector
	trigonometrical		and
	equations		scalar
	d) define hyperbolic		b) distinguish
	ratios,		between
	e) state obsbourne's		a vector and
	rule and solve		scalar quantity
	hyperbolic	et.com	c) define vector
	equations	دن,	theorems
		al.	d) solve problems
15.2.1C	Competence		involving the dot
	The trainee should		and cross
	have the ability to		products
	apply trigonometry		e) solve problems
	and hyperbolic		on
	functions in solving		gradient,
	real life situations		divergence and
			curl operators
	Content		
15.2.2T1	Trigonometric ratios	15.2.1C	Competence
	Sketches		The trainee should
	Compound formulae		have the ability to:
	Deviation of factor		f) define a vector
	formulae		and
15.2.2T2	Solution of right		scalar
	angled triangle		g) distinguish
	parameters		between
15.2.2T3	Definition of		a vector and
	hyperbolic ratios		scalar quantity
15.2.2T4	Obsournes rule		h) define vector
	Statement		theorems

- i) solve problems involving the dot and cross products j) solve problems gradient, divergence and curl operators Content Definition of a vector and scalar
- 15.2.3T 2 Distinction between a vector and scalar quantity 15 2 3T 3 Definition of vector theorem Resolution Proof of ratio theorem Application of ratio theorem 15 2 3T 4 Solution of problems on dot and

15 2 3T 1

- cross products 15.2.3T5 Gradient, divergence
- and curl operators Definition Calculations

#### 15.2.4 **MATRICES II**

15.2.4T0 Specific Objectives By the end of the sub-module unit, the trainee should be able to: a) perform 3x3 matrix

- operations
- b) determine the determinant of a 3x3 matrix using co-factor method and sirus rule
- c) solve a problem using crammers rule
- d) determine the inverse of a 3x3 matrix
- e) apply matrices in solving linear simultaneous equations with three unknowns

15.2.1C

Competence The trainee should have the ability to: i.perform 3x3 matrix ii.operations iii determine the iv.determinant of a 3x3 matrix using cofactor method and sirus rule v.solve a problem vi.using crammers rule vii.determine the viii.inverse of a 3x3 matrix ix.apply matrices in x.solving linear simultaneous equations with three unknowns

	Content		e) determine higher
15.2.4T1	Performing 3x3		derivatives
	matrix operations		f) define partial
15.2.4T2	Determination of		derivatives of a
	determinant of a 3x3		function of two
	matrix using:		variables
	Co-factor method		g) solve problems
	Sirus rule		involving small
15.2.4T3	Solution of		changes or errors
	problems using		using partial
	cramer's rule		derivatives
15.2.4T4	Determination of the		h) determine
	inverse of a 3x3		stationary points
	matrix		of functions of
15.2.4T5	Application of		two variables
	matrices in solving		integrate equations
	linear simultaneous	2	
	equations with three	رن/	Content
	unknowns	15.2.5T1	Definition of
		in the second	differentiation
15 2 5	CALCULUS	15.2.5T2	Determination of
15.2.5	CALCULUS	13.2.312	Determination of
	CALCULUS	13.2.312	derivatives (Xn,
15.2.5T0	Specific Objectives		derivatives (Xn, trigonometric)
	Specific Objectives By the end of the	15.2.5T3	derivatives (Xn, trigonometric) Reference to tables
	Specific Objectives By the end of the sub-module unit, the	15.2.5T3	derivatives (Xn, trigonometric) Reference to tables of derivatives
	Specific Objectives  By the end of the sub-module unit, the trainee should be		derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of
	Specific Objectives By the end of the sub-module unit, the trainee should be able to:	15.2.5T3 15.2.5T4	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation
	Specific Objectives  By the end of the sub-module unit, the trainee should be able to:  a) define the	15.2.5T3	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation Determination of
	Specific Objectives  By the end of the sub-module unit, the trainee should be able to:  a) define the derivative of a	15.2.5T3 15.2.5T4 15.2.5T5	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation Determination of higher derivatives
	Specific Objectives  By the end of the sub-module unit, the trainee should be able to:  a) define the derivative of a function	15.2.5T3 15.2.5T4	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation Determination of higher derivatives Definition of partial
	Specific Objectives  By the end of the sub-module unit, the trainee should be able to:  a) define the derivative of a function  b) find derivative of	15.2.5T3 15.2.5T4 15.2.5T5 15.2.5T6	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation Determination of higher derivatives Definition of partial derivatives
	Specific Objectives  By the end of the sub-module unit, the trainee should be able to:  a) define the derivative of a function  b) find derivative of a function from	15.2.5T3 15.2.5T4 15.2.5T5	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation Determination of higher derivatives Definition of partial derivatives Solution of
	Specific Objectives  By the end of the sub-module unit, the trainee should be able to:  a) define the derivative of a function  b) find derivative of a function from the first principles	15.2.5T3 15.2.5T4 15.2.5T5 15.2.5T6	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation Determination of higher derivatives Definition of partial derivatives Solution of problems involving
	Specific Objectives  By the end of the sub-module unit, the trainee should be able to:  a) define the derivative of a function  b) find derivative of a function from the first principles  c) refer to the table	15.2.5T3 15.2.5T4 15.2.5T5 15.2.5T6 15.2.5T7	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation Determination of higher derivatives Definition of partial derivatives Solution of problems involving small changes
	Specific Objectives  By the end of the sub-module unit, the trainee should be able to:  a) define the derivative of a function  b) find derivative of a function from the first principles  c) refer to the table of derivatives of	15.2.5T3 15.2.5T4 15.2.5T5 15.2.5T6	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation Determination of higher derivatives Definition of partial derivatives Solution of problems involving small changes Determination of
	Specific Objectives  By the end of the sub-module unit, the trainee should be able to:  a) define the derivative of a function  b) find derivative of a function from the first principles  c) refer to the table of derivatives of common	15.2.5T3 15.2.5T4 15.2.5T5 15.2.5T6 15.2.5T7	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation Determination of higher derivatives Definition of partial derivatives Solution of problems involving small changes Determination of stationary points
	Specific Objectives  By the end of the sub-module unit, the trainee should be able to:  a) define the derivative of a function  b) find derivative of a function from the first principles  c) refer to the table of derivatives of common functions	15.2.5T3 15.2.5T4 15.2.5T5 15.2.5T6 15.2.5T7	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation Determination of higher derivatives Definition of partial derivatives Solution of problems involving small changes Determination of stationary points Integration
	Specific Objectives  By the end of the sub-module unit, the trainee should be able to:  a) define the derivative of a function  b) find derivative of a function from the first principles  c) refer to the table of derivatives of common functions  d) state and use	15.2.5T3 15.2.5T4 15.2.5T5 15.2.5T6 15.2.5T7	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation Determination of higher derivatives Definition of partial derivatives Solution of problems involving small changes Determination of stationary points Integration - X <sup>n</sup>
	Specific Objectives  By the end of the sub-module unit, the trainee should be able to:  a) define the derivative of a function  b) find derivative of a function from the first principles  c) refer to the table of derivatives of common functions  d) state and use rules of	15.2.5T3 15.2.5T4 15.2.5T5 15.2.5T6 15.2.5T7	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation Determination of higher derivatives Definition of partial derivatives Solution of problems involving small changes Determination of stationary points Integration - X <sup>n</sup> - Trigonometric
	Specific Objectives  By the end of the sub-module unit, the trainee should be able to:  a) define the derivative of a function  b) find derivative of a function from the first principles  c) refer to the table of derivatives of common functions  d) state and use	15.2.5T3 15.2.5T4 15.2.5T5 15.2.5T6 15.2.5T7	derivatives (Xn, trigonometric) Reference to tables of derivatives Rules of differentiation Determination of higher derivatives Definition of partial derivatives Solution of problems involving small changes Determination of stationary points Integration - X <sup>n</sup>