8.2.0

Introduction
This module unit is designed to equip the trainee with the relevant This module unit is designed to equip the trainee and attitudes necessary mathematical knowledge, skills, techniques and trade area. maniematical knowledge, skills, techniques and attrades necession to enhance better understanding of the respective trade area. 18.2.1

By the end of the module unit, the trainer should be able to: By the end of the module unit, the trainee snowing probletons and techniques in solving probletons use mathematical concepts and techniques in solving probletons. 18.2.2

- related to respective trade area
 b) organize, draw simple deductions and conclusions from a
- given data
 c) interpret graphical representation of functions relevant to the
 - Module Unit Summary and Time Allocation (55 Hours)

MATHEMATICS II 18.2.3

18.2.5 MA	TILL.	
Code Sub-Module Units 18 2.01 Complex Numbers	 Symbol j and its powers Definition of a complex number Operations on complex number graphical representation (Argand) Forms of representing complex numbers: Cartesian, polar and exponential De Moivre's theorem and its application – roots of numbers and trigonometric identities Apply complex numbers in engineering problems 	Total Hour,
18.2.02 Differential Calculus	 Gradient: straight line, curve at given point Definition of differential coefficient Differentiation from first principles Differentiation of f(x)= axn Higher derivatives Differentiation of polynomials 	15

		 Differentiation of trigonometric functions and other common function exponential. Methods of differentiation chain, product, quotient rules, parametric functions Standard derivatives Applications of differentiation to curve sketching, rates of change Application of turning points Partial differentiation of function in 2 variables Applications of partial differential in small changes and stationery points, rates of change 	
ji i	Hyperbolic Functions	 Definitions Obsorn's rule Identities Equations of the form ach x + bsh x = c 	Z
1.04	Intergral Calculus	 Reverse differentiation/indefinite integral Integral of y = f(x) = axn Definite standard integrals Methods of integration: Substitution, partial fractions, parts Reduction formula Application of integration: area, volumes of solids of revolution, controids and 	5
12.05	Ordinary Differential Equations (First and Second Order)	 Formation of Ordinary Differential Equations Methods of solving first order Differential Equations by direct integration , separation of variables, linear, homogeneous Application of ODE in simple harmonic motion and building Second order differential equations with constant coefficients – the forms: d2y + n2y = k 	5

18.2.06		 ad2y + bdy - cy = 0 dx2 dx2 ad2y + bdy + cy = f(x) dx2 dx Application of ordinary differential equations in simple harmonic motion, growth and decay Theorems 	
10.2.06	D-Operator	Solution of differential equations	2
18.2.07	Power Series	 Taylor theorem and series Maclauren theorem and series Application of Taylor and Maclauren series 	5
		Total	

	ATICS II		
SERIE SERIE	COMPLEX NUMBERS Specific Objectives Specific Objectives Sy the end of the sub- module unit, the trainee module unit, the trainee should be able to: should be able to: a) define a complex number b) determine the power of j c) perform arithmetic operations on operations on	18.2.01T1 18.2.01T2 18.2.01T3 18.2.01T4	Definition of a complex number Powers of j Arithmetic operations on complex numbers Graphical representation of complex (Argand diagram) Forms of representing complex numbers - cartesian - polar
	operations complex numbers d) represent complex numbers on the Argand diagram e) express complex numbers in three forms f) state and apply De Moivre's theorem g) apply complex numbers in engineering	18.2.01T6	- roots of numbers - trigonometric identities Application of complex numbers - resolution of forces - loci DIFFERENTIAL CALCULUS
JR2.01C	Competence The trainee should have the ability to: i) apply De Moivres theorem ii) apply complex numbers in engineering iii) perform arithmetic operations on complex numbers Content	18,2.02	Specific Objectives By the end of the submodule unit, the trainee should be able to: a) define differentiation b) differentiate from first principles c) use standard derivatives in solving problems d) state the rules of differentiation

	e) apply the rules of find find the rules of		
	and do and to	18.2.08 T8	Differen
	ungono. allyes of	18.2.09 T9	Differentiation of Differentiation parameters
	10garithm:	10,2.05	η για
	function		differention of the 1p
	differentiate		" (C) (C) (C) (C)
	, Polynomials		- curve oketed character turning
	g) find higher derivatives of		turning the
	functions		radhuc mh
	h) determine derivatives of		curvature application
	implicit functions	18.2.10 T10	application turning points D Partial differentiation two variables
	i) find derivatives of		two variables
	parametric equations	18.2.11 T1	
	j) apply differentiation		~ Small .
	k) find partial derivatives	_	- small changes - stationery point - rates of changes
	l) apply turning points	con	- rates of change
	` ·		maxima Till
	m) apply partial	ler.	- saddle not mining
	m) apply partial differentiation	18 2 03	- saddle points
10 2 01 71	Content	18.2.03	+ saddle points
18.2.01 T1	Definition of differential		HYPERBOLIC FUNCTIONS
18.2.01 T1 18.2.02 T2	Content	18.2.03	HYPERBOLIC FUNCTIONS Specific Objection
18.2.02 T2	Definition of differential - coefficient Differentiation from first principles		HYPERBOLIC FUNCTIONS Specific Objectives By the end of the
18.2.02 T2 18.2.03 T3	Definition of differential - coefficient Differentiation from first principles Standard derivatives		HYPERBOLIC FUNCTIONS Specific Objectives By the end of the sub- module unit, the
18.2.02 T2 18.2.03 T3	Definition of differential - coefficient Differentiation from first principles Standard derivatives Rules of differentiation		HYPERBOLIC FUNCTIONS Specific Objectives By the end of the submodule unit, the trainer should be able to: a) define hyperbolic
18.2.02 T2 18.2.03 T3	Definition of differential - coefficient Differentiation from first principles Standard derivatives		HYPERBOLIC FUNCTIONS Specific Objectives By the end of the sub. module unit, the trainer should be able to: a) define hyperbolic functions
18.2.02 T2 18.2.03 T3 18.2.04 T4	Definition of differential - coefficient Differentiation from first principles Standard derivatives Rules of differentiation - product - quotient - chain rule		HYPERBOLIC FUNCTIONS Specific Objectives By the end of the sub. module unit, the trainet should be able to: a) define hyperbolic functions b) evaluate hyperbolic
18.2.02 T2 18.2.03 T3	Definition of differential - coefficient Differentiation from first principles Standard derivatives Rules of differentiation - product - quotient - chain rule Differentiation of		HYPERBOLIC FUNCTIONS Specific Objectives By the end of the sub. module unit, the trainer should be able to: a) define hyperbolic functions b) evaluate hyperbolic functions for given
18.2.02 T2 18.2.03 T3 18.2.04 T4	Definition of differential - coefficient Differentiation from first principles Standard derivatives Rules of differentiation - product - quotient - chain rule Differentiation of trigonometric,		HYPERBOLIC FUNCTIONS Specific Objectives By the end of the sub. module unit, the trainet should be able to: a) define hyperbolic functions b) evaluate hyperbolic functions for given arguments
18.2.02 T2 18.2.03 T3 18.2.04 T4	Definition of differential - coefficient Differentiation from first principles Standard derivatives Rules of differentiation - product - quotient - chain rule Differentiation of trigonometric, logarithmic and		HYPERBOLIC FUNCTIONS Specific Objectives By the end of the sub. module unit, the trainee should be able to: a) define hyperbolic functions b) evaluate hyperbolic functions for given arguments c) state Osborne's pile
18.2.02 T2 18.2.03 T3 18.2.04 T4	Definition of differential - coefficient Differentiation from first principles Standard derivatives Rules of differentiation - product - quotient - chain rule Differentiation of trigonometric, logarithmic and exponential functions Differentiation of		HYPERBOLIC FUNCTIONS Specific Objectives By the end of the sub. module unit, the trainet should be able to: a) define hyperbolic functions b) evaluate hyperbolic functions for given arguments c) state Osborne's rule d) relate trigonometric identities to
18.2.02 T2 18.2.03 T3 18.2.04 T4 18.2.05T5	Definition of differential - coefficient Differentiation from first principles Standard derivatives Rules of differentiation - product - quotient - chain rule Differentiation of trigonometric, logarithmic and exponential functions Differentiation of polynomials		HYPERBOLIC FUNCTIONS Specific Objectives By the end of the submodule unit, the trainer should be able to: a) define hyperbolic functions b) evaluate hyperbolic functions for given arguments c) state Osborne's rule d) relate trigonometric identities to hyperbolic identities
18.2.02 T2 18.2.03 T3 18.2.04 T4	Definition of differential - coefficient Differentiation from first principles Standard derivatives Rules of differentiation - product - quotient - chain rule Differentiation of trigonometric, logarithmic and exponential functions Differentiation of		HYPERBOLIC FUNCTIONS Specific Objectives By the end of the submodule unit, the trainer should be able to: a) define hyperbolic functions b) evaluate hyperbolic functions for given arguments c) state Osborne's rule d) relate trigonometric identities to hyperbolic identities e) solve equations of
18.2.02 T2 18.2.03 T3 18.2.04 T4 18.2.05T5	Definition of differential - coefficient Differentiation from first principles Standard derivatives Rules of differentiation - product - quotient - chain rule Differentiation of trigonometric, logarithmic and exponential functions Differentiation of polynomials		HYPERBOLIC FUNCTIONS Specific Objectives By the end of the submodule unit, the trainer should be able to: a) define hyperbolic functions b) evaluate hyperbolic functions for given arguments c) state Osborne's rule d) relate trigonometric identities to hyperbolic identities

	245	18.2.04	INTEGRAL
	Competence		CALCULUS
e-10	et a traffice disc	220 Sec.	
13.7	1. ITV IV.	18.2.04	Specific Objectives
	dersidila		By the end of the sub-
78 8	derivatives in		module unit, the trainee
	alving problems		should be able to:
	-by miles 01		 a) define integration
	differential to find	1.0	 b) deduce integration
	derivatives of		by reverse
	wigonometric,		differentiation
	logarithmetic and	. 47	c) solve problems
	exponential	4111	involving standard
	exponent		integrals
	Content	all has the	d) evaluate definite
1922		9	integrals
18.201 TI	functions	A STATE OF THE PARTY OF THE PAR	e) integrate functions
100	Turis 6		using different
182.02 T2	hyperbolic functions	$\mathbb{C}_{\mathcal{O}}$	methods
100 mm	3000 The Control of Co		f) deduce reduction
182.03 T3	Hyperbolic identities	S	formulae
182.04 T4	C to come Of	60°	g) apply reduction
182.05 T5	the form ach	11 11	formulae determine
	x + bshx = c	The state of	integrals
		The second second	h) apply integration
18.2.03C	Competence	Profession	e Marchael
	The trainee should have	18.2.04C	Competence
	the ability to:	The second	The trainee should
	 i) evaluate hyperbolic 		have the ability to:
	functions for given	Style Martin	i) reduce integration
	arguments		differentiation
li	ii) relate trigonometric	A STATE OF	
en	identities to		ii) evaluate definite integrals
	hyperbolic identities		iii)apply reduction
uk	iii) solve equations of		formulae to
1831	the form ach x +		determine integrals
tic .	bshx = c	2	determine mograns .
of			Content
		18.2.01 T1	Definition of integration
		18.2.02 T2	Integration by reverse
		10.2.02 12	differentiation
		18.2.03 T3	Standard integrals
	The American Committee of the Committee	10.2.03 13	

18.2.04	T4 Definite integrals	18.2.05C	Common
18.2.05	T5 Methods of integration		Competence The trainee should
	- substitution	1	nave the ability to:
		i	form a differential
	- partial fractions		com a differen
18.2.06	- parts T6 Reduction formulae	i	i) solve for
	deduction	1.5	i) solve first order
18.2.07	Park 12 1 22 작가 :		firet a contain contain
-14.07	The state of the s	. 1	differential equitors apply differential equations as a series of the se
	integrals using reduction	1	TO A DOLLA MARK
18.2.08	formula		equations with
10.2.00			coefficient
	integration		_
	- area		O CONTRACTOR OF THE PARTY OF TH
	- volumes of solids	1020177	Content
	of revolution	18.2.01 T1	Definition of a
	 centroids centre of 		differential ac
	mass	18.2.02 T2	Formation of
2/2/00/18/07	* * *		differential equation
18.2.05	ORDINARY		
	DIFFERENTIAL		Situations eli-
	EQUATIONS		of arbitrary constant
	(FIRST AND	18.2.03T3	Solution Constants
	SECOND ORDER)	<i>5</i> .	Solution of fire order differential
			equations v
18.2.05	Specific Objectives		equations; direct
	By the end of the sub-		integration, variable
	module unit, the trainee		separation, linear
	should be able to:		equations, homogeness
	a) define a differential	11- 14-94-10-21/0-21/0-21/0-01	equations
		18.2.04 T4	Solution of second one
	equation	4 4 50000	differential equations
	 b) form differential 		the forms
	equations	18.2.05 T5	
20	c) solve first order	10.2.05 15	L'Estation of
	differential equations		differential equations
	of first degree		- growth and dec
	d) solve second order		- simple harmonic
	differential	14	motion (SHM)
	differential equations		- building
	with constant		- Junuing
	coefficients	10.000	CONTRACTOR DE L'ENTREMENTANTE
	e) apply differential	18.2.06	D-OPERATOR
	equations to practical		
	situations	18.2.06	Specific Objectives
	OTTURNONS		opecific Objective

By the end of the sub-		
module unit, the trainee		
should be able to:		
a) state theorems of D-	18.2.07C	C-
operator		Competence
b) solve differential		The trainee should have
equations using D-		aninty to-
		i) deduce maclaurin's
operator		theorem in numerical work
		ii) use Taylor's theorem
Competence		y ace raylor's theorem
The trainee should have		Content
the ability to:	18.2.07T1	Power series
i) state theorems of d-	BHILDER OVER CONS.	explanation
operator.	18.2.07T2	Taylor's theorem
ii) solve differential	18.2.07T3	Taylor's series
equations	18.2.07T4	Maclaurin's theorem
and the second s	THE RESIDENCE	The state of the s
Content		Suggested
Theorems of D-operator	ALC: YES	Teaching/Learning
Solution of differential	0	Methods
equations using D-	$^{\circ}C_{O}$	- Lecture
operator	et.	 Group work
	and the same of th	
POWER SERIES	0,000	Suggested The line (Learning)
The state of the s		Teaching/Learning
Specific Objectives		Resources - Charts
By the end of the sub-	N. Carlotte	- Text books
module unit, the trainee		- Calculator
should be able to:		- Calculator
a) explain power series		Suggested Assessment
b) state Taylor's		Methods
theorem		- Written tests
1 1		- Assignment
theorem to obtain		- Irad-B
power series		Tools and Equipment
		- Computer
		- Calculator
theorem in		- Calvan

18-2-06C

18.2.06T1 18.2.06T2

18.2.07

18.2.07

numerical work