7.1.0   MATHEMATICS I

7.1.0 1   Introduction
This module unit is designed to equip the trainee with the relevant mathematical knowledge, skills, techniques and attitudes necessary to enhance better understanding of other analytical units of this course, and at the same time provide the trainee with a firm foundation for further training in the trade

7.1.0 2   General Objectives
By the end of the sub module unit, the trainee should be able to:

a) use mathematical concepts and techniques in solving problems related to Automotive Engineering trade
b) organize, draw simple deductions and conclusions from the given data
c) interpret graphical representation of functions relevant to the Automotive engineering trade area.

7.1.0 3   Module Unit Summary and Time Allocation

Mathematics I

Code	Sub Module Unit	Content	Time Hrs
7.1.1	Fractions and Decimals	- Proper fractions and mixed - numbers - Conversion of mixed and improper - Fractions and vice versa - Application of the knowledge of decimals to engineering problems - Application of fraction to real life situations - Conversion of fractions into decimals and vice versa - Recurring decimals - Compare fractions	14
7.1.2	Indices and Logarithms	- Base and index - Laws of indices	10

		• Indicial equations 'logarithm • Laws of logarithm • Logarithmic equations • Conversion of bases • Use of calculator	
7.1.3	Algebra	• Reduction of equations • Solution of equations reduced to quadratic form • Solutions of simultaneous linear equations in three unknowns • Solution of problems involving AP and GP	14
7.1.4	Trigonometry	• Half −angle formula • Factor formula • Trigonometric functions • Parametric equations	10
7.1.5	Permutations and Combinations	• Definition of permutation • Definition of combination • The factorial notation • Expressions involving permutations and combinations • Solution of problems involving permutations and combinations	12
7.1.6	Binomial Expansion	• Binomial theorem Power series using binomial theorem Roots of numbers using binomial theorem • Estimation of errors of small changes using binomial theorem	12
7.1.7	Coordinate Geometry	• Polar equations • Cartesian equation • Graphs of polar equations • Normals and tangents	12
7.1.8	Hyperbolic Functions	• Definition of hyperbolic equations • Properties of hyperbolic	18

		• functions	
		• Evaluation of hyperbolic functions	
		• Hyperbolic identities	
		• Osborne's Rule	
		• Achx+bshx=C equation	
7.1.9	Inverse Functions	• One to-one relationship in functions	18
		• Inverse functions for one-to-one relationship	
		• Inverse functions for trigonometric functions	
		• Graph of inverse functions	
		• Inverse hyperbolic functions	
	Complex numbers	• Definition of complex numbers	12
		• Stating complex numbers in terms of conjugate argument and	
		• modulus	
		• Representation of complex numbers on the Argand diagram	
		• Arithmetic operation of complex numbers	
		• Application of Demoivre's theorem	
		• Application of complex numbers to engineering	
Total Time			**132**

7.1.1 FRACTIONS AND DECIMALS

7.1.1T0 *Specific Objectives*
By the end of the sub module unit, the trainee should be able to:
a) identify proper, improper and mixed fractions
b) convert mixed numbers to improper fractions and vice versa
c) compare fractions
d) apply the knowledge of fractions to real life situations
e) convert fractions into decimals and vice versa
f) identify recurring decimals
g) convert recurring decimals into fractions
h) apply the knowledge of decimals to engineering problems

7.1.1C Competence
The trainee should have the ability to:
i) Perform the basic operations on fraction and decimals
ii) Apply the knowledge of fractions and decimals in engineering

Content
7.1.1T1 Proper fractions and mixed numbers
7.1.1T2 Conversion of mixed and improper fractions and vice versa
7.1.1T3 Comparison of fractions
7.1.1T4 Application of fraction to real life situations
7.1.1T5 Conversion of fractions into decimals and vice versa
7.1.1T6 Identification of Recurring decimals
7.1.1T7 Conversion of recurring decimals into fractions
7.1.1T8 Application of the knowledge of decimals to engineering problems

Suggested Learning Resources
- Chart illustration on fractions equivalent fraction
- Real life situations

7.1.2 INDICES AND LOGARITHMS

7.1.2T1 *Specific Objectives*
By the end of the sub module unit, unit the trainee should be able to:
a) define the terms base and index
b) state the laws of indices
c) perform simple operations of

indices
d) define the term logarithm
e) state laws of logarithms
f) perform simple operations of logarithms
g) change the bases of logarithms
h) use calculator in solving problems related to logarithms

7.1.2C Competence

The trainee should have the ability to work out mathematical problems related to indices and logarithms

Content

7.1.2T1 Base and index
7.1.2T2 Laws of indices
7.1.2T3 Opera rations of indices
7.1.2T4 Definition of Logarithm
7.1.2T5 Laws of Logarithm
7.1.2T6 Operations of Logarithms
7.1.2T7 Changing bases of Logarithms
7.1.2T 8 Use of calculator in solving problems related to logarithms

Suggested Learning Resources
- Calculates
- Charts
- Audio visual media

7.1.3 ALGEBRA

7.1.3T1 *Specific Objectives*

By the end of the sub module unit, unit the trainee should be able to:
a) reduce logarithmic equations to quadratic equations
b) solve equations reduced to quadratic forms
c) solve linear simultaneous equations with three unknowns
d) solve problems involving Arithmetic Progression (AP) and Geometric Progression (GP)

Content

7.1.3T1 Reduction of equations
7.1.3T2 Solution of equations reduced to quadratic form
7.1.3T3 Solutions of simultaneous linear equations in three unknowns
7.1.3T4 Solution of problems involving AP and GP

Suggested Learning Resources
- Print media
- Audio media
- Real live experience

7.1.4 TRIGONOMETRY

7.1.4T0 *Specific Objectives*

By the end of the sub module unit, unit the trainee should be able to:
a) derive the half-

angle
b) derive the factor formula
c) solve trigonometric functions
d) determine parametric equations

Content
7.1.4T1 Half –angle formula
7.1.4T2 Factor formula
7.1.4T3 Trigonometric functions
7.1.4T4 Parametric equations

Suggested Learning Resources
- Charts
- Mathematical tables
- Calculators
- Light-angled triangles
- Real life experience

7.1.5 PERMUTATIOONS AND COMBINATIONS

7.1.5T0 *Specific Objectives*

By the end of the sub module unit, unit the trainee should be able to:
a) define the term permutation
b) define the term combination
c) express numbers in factorial notation
d) simplify expressions involving permutations and combinations

e) solve problems involving permutation and combination.

7.1.5C Competence
The trainee should have the ability to solve problems in permutations and combinations

Content
7.1.5T1 Definition of permutation
7.1.5T2 Definition of combination
7.1.5T3 The factorial notation
7.1.5T4 Expressions involving permutations and combinations
7.1.5T5 Solution of problems involving permutations and combinations

Suggested Learning Resources
- Charts
- Real life situations

7.1.6 BINOMIAL EXPANSION

7.1.6T0 *Specific Objectives*

By the end of the sub module unit, unit the trainee should be able to:
a) State the binomial theorem
b) Apply the binomial theorem in deriving power series of simple functions
c) Apply binomial theorem to

estimate errors of small changes

d) Apply binomial theorem to estimate roots of numbers

7.1.6C Competence

The trainee should have the ability to apply binomial theorem to estimating errors.

Content

7.1.6T1 Binomial theorem

7.1.6T2 Power series using binomial theorem

7.1.6T3 Roots of numbers using binomial theorem

7.1.6T4 Estimation of errors of small changes using binomial theorem

Suggested Learning Resource
-   Charts

7.1.7 COORDINATE GEOMETRY

7.1.7T0 Specific Objectives

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

a) Convert polar equations to Cartesian equation

b) Convert Cartesian equation to polar equations

c) Plot graphs of polar equations

d) Determine normals and tangents using co-ordinate geometry

7.1.7C Competence

The trainee should have the ability to work out problems in coordinate geometry

Content

7.1.7T1 Polar equations

7.1.7T2 Cartesian equation

7.1.7T3 Graphs of polar equations

7.1.7T4 Normals and tangents

Suggested Learning Resources
-   Charts
-   Squared grid-board
-   Calculators

7.1.8 HYPERBOLIC FUNCTIONS

7.1.8T0 *Specific Objectives*

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

a) Define hyperbolic functions

b) Deduce properties of hyperbolic functions

c) Evaluate hyperbolic functions for given arguments

d) Verify simple hyperbolic relationships of identities

e) Sate the Osborne's rule

f) Solve equations of the form $achx+bshx=C$

7.1.8C Competence
The trainee should have the ability to work out problems in hyperbolic functions.

Content
7.1.8T1 Definition of hyperbolic equations
7.1.8T2 Properties of hyperbolic functions
7.1.8T3 Evaluation of hyperbolic functions
7.1.8T4 Hyperbolic identities
7.1.8T5 Osborne's Rule
7.1.8T6 Achx+bshx=C equation

Suggested Learning Resources
- Tables
- Calculators

7.1.9 INVERSE FUNCTIONS

7.1.9T1 Specific Objectives
By the end of the sub module unit, unit the trainee should be able to:
a) identify one-to-one relation in functions
b) define inverse function for one-to-one relationship
c) define inverse function for trigonometric functions
d) draws graphs of inverse functions
e) describe many valued nature of functions
f) describe the principal of inverse trigonometric

function
g) derive the inverse hyperbolic function

Content
7.1.9T1 One to-one relationship in functions
7.1.9T2 Inverse functions for one-to-one relationship
7.1.9T3 Inverse functions for trigonometric functions
7.1.9T4 Graphs of inverse functions
7.1.9T5 Description of many valued nature of functions
7.1.9T6 Describe the principle of inverse trigonometric function
7.1.9T7 Derivation of inverse hyperbolic function

Suggested Learning Resources
- Tables
- Calculators

7.1.10 COMPLEX NUMBERS

7.1.10T0 Specific Objectives
By the end of the sub module unit, unit the trainee should be able to:
a) define a complex number
b) state complex numbers in three forms
c) segment complex numbers on the argand diagram
d) perform arithmetic

operation on complex numbers

e) state and apply the Demoivre's theorem

f) apply complex numbers to engineering problems

Content
7.1.10T1   Definition of complex numbers
7.1.10T2   Stating complex numbers in terms of conjugate argument and modulus
7.1.10T3   Representation of complex numbers on the Argand diagram
7.1.10T4   Arithmetic operation of complex numbers
7.1.10T5   Application of Demoivre's theorem
7.1.10T6   Application of complex numbers to engineering

Competence
The trainee should have the ability to:
- Demonstrations
- Questions and answers
- Discussions

Suggested Learning Resources
- Charts
- Calculators