14.2.0 ENGINEERING MATHEMATICS II

14.2.1 Introduction

This module unit is designed with knowledge, skills, techniques and attitudes necessary to enhance the understanding other analytical areas of study in this course. Trainees will build up on what was learned in Module I of this course. It is therefore necessary that trainees taking this module unit require to have covered Mathematics I of Module I of the course or its equivalent.

14.2.2 General Objectives

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

a) Apply mathematics concepts in fabrication design and data analysis
b) organize, draw simple deductions and conclusions from the given data
c) apply probability Mensurations in structural fabrication

14.2.3 Module Unit Summary and Time Allocation

ENGINEERING MATHEMATICS II

Code	Sub-module Units	Content	Time Hrs
14.2.01	Probability	• 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	10
14.2.02	Statistics	• Definition of statistics • Measures of centre tendency • Measures of dispersion	8
14.2.03	Sequence and Series	• Sequence and series • Simple and compound interest • Arithmetic and geometric progressions	6
14.2.04	Vectors	• Operation of vectors • Resolution of vectors into vertical and horizontal	4

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		components • Relative velocity	
14.2.05	Mensurations	• Units of measurements • Perimeters, areas, volumes of regular figures and solids • Area of irregular figures	4
14.2.06	Integral Calculus	• Definition of integration • Indefinite and definite integrals • Methods of integration • Application of integration	8
14.2.07	Differential Calculus	• Definition of derivative of a function • Differentiation from first principle • Tables of some common derivatives • Rules of differentiation • Higher order derivatives • Definition of partial dervative • Partial differentiation for function of two variables • Application of partial differentiation to small changes, stationary points, curve sketching and rates of change	14
14.2.08	Power Series	• Definition of the term power series • Taylor's theorem • Deduction of Maclaurin's theorem from Taylor's theorem • Use Taylor's theorem to obtain power series • Use Maclaurin's theorem to obtain power series • Application of Taylor's theorem and Maclaurin's theorems in numerical work	12
Total Time			**66**

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14.2.01 PROBABILITY

Theory

14.2.01T0 *Specific Objectives*

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

a) define the terms probability
b) state and apply the laws of probability
c) determine the expected value, variance and standard deviation
d) illustrate the different types of distributions
e) calculate the mean, variance and standard deviation of probability functions
f) apply the knowledge of probability distribution to solve practice problems

14.2.01C *Competence*

The trainee should have the ability to work out mathematical problems related to probability

Content

14.2.01T1 Definition of probability
14.2.01T2 Laws of probability
14.2.01T3 Expectation variance and S.D.
14.2.01T3 Types of distributions
14.2.01T4 Mean, variance and SD of probability distributions
14.2.01T5 Application of probability distributions

Suggested Teaching/Learning Resources

- Calculates
- Charts
- Audio visual media

14.2.02 STATISTICS

Theory

14.2.02T0 *Specific Objectives*

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

a) define statistics
b) apply measures of central tendency in calculations
c) apply measures of dispersion in calculations

14.2.02C *Competence*

The trainee should have the ability to apply statistical knowledge to engineering

Content

14.2.02T1 Definition of statistics
14.2.02T2 Measures of centre tendency

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14.2.02T3 Measures of dispersion

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

14.2.03 SEQUENCE AND SERIES

Theory

14.2.03T0 *Specific Objectives*
By the end of the sub module unit, the trainee should be able to:
a) distinguish between a sequence and a series
b) solve problems involving in series
c) apply the knowledge of series in calculating simple and compound interest.

14.2.03C *Competence*
Apply sequence and series to engineering problems

Content
14.2.03T1 Sequence and series
14.2.03T2 Arithmetic and geometric progressions
14.2.03T3 Simple and compound interest

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

14.2.04 VECTORS

Theory

14.2.04T0 *Specific Objectives*
By the end of the sub module unit, the trainee should be able to:
a) carry out operations on vectors
b) resolve vectors into horizontal and vertical components
c) determine relative velocity

14.2.04C *Competence*
The trainee should have the ability to solve problems in vectors

Content
14.2.04T 1 Operation of vectors
14.2.04T 2 Resolution of vectors into vertical and horizontal components
14.2.04T 3 Relative velocity

Suggested Learning Resources

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- Charts
- Real life situations

14.2.05 MENSURATIONS

Theory

14.2.05 T0 *Specific Objectives*
By the end of the sub module unit, the trainee should be able to:
a) state different units of measurements
b) calculate perimeters, areas, volumes of regular figures and solids
c) use appropriate methods to calculate areas of irregular figures

14.2.05C *Competence*
The trainee should have the ability to work out problems related to mensurations

Content

14.2.05T1 Units of measurements
14.2.05 T2 Perimeters, areas, volumes of regular figures and solids
14.2.05 T3 Area of irregular figures

Suggested Learning Resources
- Charts
- 3D objects

14.2.05 INTEGRAL CALCULUS

Theory

14.2.05 *Specific Objectives*
By the end of the sub module unit, the trainee should be able to:
a) define integration
b) differentiate between indefinite and definite integrals
c) solve problems involving various methods of integration
d) apply integration to real life situations.

14.2.05C *Competence*
The trainee should have the ability to apply knowledge in integral calculus to engineering

Content

14.2.05T1 Definition of integration
14.2.05T2 Indefinite and definite integrals
14.2.05T3 Methods of integration
14.2.05T4 Application of integration

Suggested Teaching/Learning Activities
- Demonstration
- Plotting

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- Discussion

14.2.06 DIFFERENTIAL CALCULUS

Theory

14.2.06T0 *Specific Objectives*
By the end of the sub module unit, the trainee should be able to:

a) define the derivative of a function
b) differentiate from first principle
c) refer to tables of derivatives of some common functions
d) state and use rules of differentiation
e) determine the derivative of higher order
f) define partial derivatives of two variables
g) differentiate partially functions of two variables
h) apply differentiation to stationary points curve sketching rates of change, small changes
i) Solve problems involving small changes using partial factions
j) Find stationary points for functions of two variables

14.2.06C *Competence*
The trainee should have the ability to apply differential calculus engineering

Content

14.2.06T1 Definition of derivative of a function
14.2.06T2 Differentiation from first principle
14.2.06T3 Tables of some common derivatives
14.2.06T4 Rules of ifferentiation
14.2.06T5 Higher order derivatives
14.2.06T6 Definition of partial derivative
14.2.06T7 Partial differentiation for function of two variables
14.2.06T8 Application of partial differentiation to small changes, stationary points, curve sketching and rates of change
14.2.06T9 Solution of problems involving small changes using partial derivative
14.2.06T10 Finding of stationery points for functions of two variables

Suggested Learning Resources

- Tables
- Calculators

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14.2.07 POWER SERIES

Theory

14.2.07T0 *Specific Objectives*
By the end of the sub module unit, the trainee should be able to:

a) explain the term power series
b) state Taylor's theorem
c) deduce Maclaurin's theorm from Taylor's theorem
d) use Taylor's theorem to obtain power series
e) use Maclaurin's theorem to obtain power series
f) apply Taylor's and Maclaurin's theorems of numerical work

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14.2.07C *Competence*
The trainee should have the ability to apply the concept of power series in engineering work

Content

14.2.07T1 Explanation of the term power series
14.2.07T2 Taylor's theorem
14.2.07T3 Deduction of Maclaurin's theorem from Taylor's theorem
14.2.07T4 Use Taylor's theorem to obtain power series
14.2.07T5 Use Maclaurin's theorem to obtain power series
14.2.07T6 Application of Taylor's theorem and Maclaurin's theorems in numerical work.

Suggested Learning Resources

- Mathematics tables
- Calculators