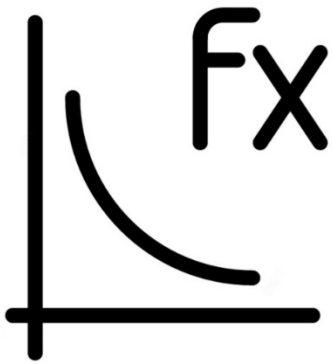
Level 3 - Unit 8 – Further Engineering Mathematics

BTEC

Knowledge Organiser

Further Maths



Learners use algebraic and statistical methods to carry out mathematical modelling and analysis to solve engineering problems

Unit Overview

Mathematics can be used to evaluate the intended and actual performance of a product or system at every stage of its life cycle. For example, mathematics may be used during the design of a product to determine whether it performs to specification. Statistics may be used during manufacturing processes as part of the quality control (QC) system and to determine the in-service reliability of a product. Statistics can also be used to evaluate the vast amounts of data that can be gathered about products and customers using mobile communications and the Internet of Things (IoT).

In this unit you will use algebraic techniques to solve engineering problems involving sequences, series, complex numbers and matrices; these topics support other units in the BTEC programme such as Unit 16: Three Phase Electrical Systems, Unit 27: Static Mechanical Principles in Practice and Unit 28: Dynamic Mechanical Principles in Practice. You will investigate the use of statistics as a data-processing and analysis tool, for example, applying techniques used by a quality assurance engineer to monitor the output from a manufacturing process.

Learning Aim A

learners will demonstrate mastery in the application of algebraic techniques to the correct solution of given problems involving sequences and series. Where appropriate to non-routine problems, learners will correctly and efficiently manipulate formulae and present reasoned and balanced evaluations.

Learning Aims:

A Examine how sequences and series can be used to solve engineering problems
B Examine how matrices and determinants can be used to solve engineering problems
C Examine how complex numbers can be used to solve engineering problems
D Investigate how statistical and probability techniques can be used to solve engineering problems

Learning Aim B and C

learners will demonstrate mastery in the application of algebraic techniques to the correct solution of given problems involving matrices, determinants and complex numbers. Where appropriate to non-routine problems, learners will correctly and efficiently manipulate formulae and present reasoned and balanced evaluations.

Learning Aim D

learners will demonstrate mastery in the application of the processing and evaluation of statistical data generated from engineering sources. The identified problems must be sufficiently complex to allow learners to apply both routine and non-routine operations (skills and methods) to their solution. For example, in terms of measures of central tendency and dispersion, learners may evaluate one set of measured and four sets of equivalent historical data, such as dimensional data from a machining operation or reliability data sourced from products in service. Before starting to process any data, learners will establish that the datasets are large enough to enable reliable analysis to be carried out. For regression, they will propose a theoretical relationship between two variables, collect data, calculate a mathematical relationship between dependent and independent variables using appropriate analytical and graphical methods, and reflect on the accuracy of the initial proposal for a linear and a non-linear relationship

Key Vocabulary

Near-optimal, differential,

Work Related Learning:

Gaining mathematics knowledge to assist in a manufacturing or Engineering career.

Numeracy links:

This unit is a maths and physics based units so covers a wide range on numeracy.

SMSC and British Values

Understanding the importance maths ad physics plays in solving serious world issues.