Mathematics for Engineering 2

HIGHER NATIONAL DIPLOMA

工程数学：II

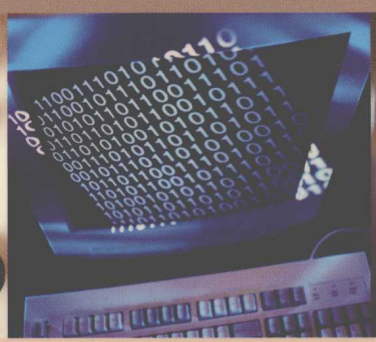
【英】苏格兰学历管理委员会（SQA）

英文原版

Unit Student Guide

ELECTRONIC ENGINEERING DG4L 34



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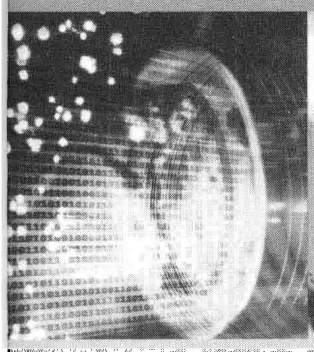
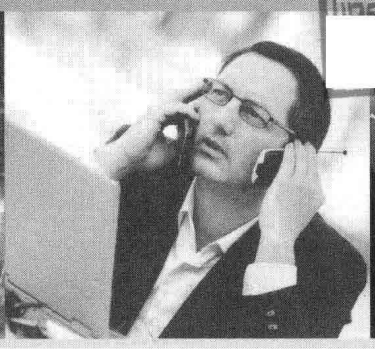
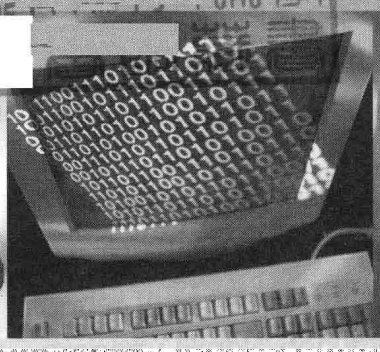


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Contents

1 Introduction to the unit

1.1 What this unit is about

This unit is designed to give candidates knowledge and understanding and an ability to apply differential and integral calculus to engineering problems. The unit will enable candidates to:

- carry out the differentiation and integration of standard functions;
- use numerical and computer techniques to solve problems which can be applied to engineering.

1.2 Outcomes

On completion of the unit candidates should be able to:

- differentiate standard functions;
- perform definite and indefinite integration of standard functions;
- use differentiation to solve problems which involve rates of change, maxima and minima, and the Newton-Raphson method;
- use integration of functions to solve problems of

area, volumes, averages, centroids, radius of gyration, boundary value problems, and to make use of Simpson's rule for non-standard functions.

1.3 Unit structure

This unit contains the following study sections:

Section number and title	Approx. study time
1. Introduction to differentiation	2 hours
2. Differentiating functions	8 hours
3. Indefinite integration	8 hours
4. Definite integration	6 hours
5. Numerical methods	12 hours

Learning Outcome 1 is covered by sections 2, 3 and 4.

Learning Outcome 2 is covered by section 5.

1.4 How to use these learning materials

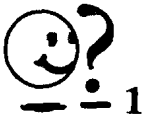
These notes have been produced with self study in mind with many worked examples, activities and self assessment questions. Nonetheless, you should consult regularly with your tutors as they are there to help you understand the material, to assist you with problems and to monitor your progress.

At the end of each study section you should complete the tutor assignment. Your tutor will assess your progress and make arrangements for the summative

assessment.

1.5 Symbols used in this unit

As you work through the course, you will encounter a series of symbols which indicate an activity that you are expected to do. An explanation of the symbols used to identify these is given below.



This symbol is used to indicate a self-assessment question (SAQ). Most commonly, SAQs are used to check your understanding of the material that has been covered in the sections.

This type of assessment is self contained—everything is provided within the section to enable you to check your understanding of the materials.

The process is simple:

- you are set SAQs throughout the study section;
- you respond to these by writing either in the space provided in the assessment itself or in your notebook;
- on completion of the SAQ you turn to the back of the section to compare the model SAQ answers to

your own;

- if you are not satisfied after checking your responses, turn to the appropriate part of the study section and go over the topic again.

Remember—the answers to SAQs are contained within the study materials. You are not expected to guess at these answers.

This symbol indicates an activity, which usually is a set of problems that should improve or consolidate your understanding of the work just covered. The answers to activities are given at the section 8.

Remember that the SAQs and activities contained within your package are intended to allow you to check your understanding and monitor your own progress throughout the course. It goes without saying that the answers to these should be checked only after the SAQ or activity has been completed. If you refer to these answers before completing the activities you cannot expect to get maximum benefit from your course.

This symbol means that a tutor assignment, involving formative assessment, follows. These are found at the end of each study section. The aim of a tutor assignment is to cover and/or incorporate the main topics of the section and prepare you for unit (summative) outcome assessment.

1.6 Other resources required

- Pen, pencil, eraser, ruler.
- Folder, loose-leaf paper.
- Scientific calculator.
- Computer with suitable algebra package (*Derive*™ or *Mathematica*®) installed (optional).

2 Assessment information

2.1 How you will be assessed

You may be assessed either on an outcome-by-outcome basis or by a single combined assessment combining both outcomes. Assessment will be carried out under supervised, controlled conditions.

2.2 When and where you will be assessed

Summative assessment will take place after you have successfully completed the tutor-assessed assignments. Arrangements for the supervision of the summative assessment should be made with your tutor.

Outcome-by-outcome assessments

If you are being assessed on an outcome-by-outcome basis then Outcome 1 will be assessed at the end of Section 4, Outcome 2 at the end of Section 5. Outcome 1 must be attempted before Outcome 2.

Single assessment

If you are being assessed in a single assessment then you will be assessed at the end of Section 5.

Arrangements for the supervision of summative assessments should be made with your tutor.

2.3 What you have to achieve

You will need to demonstrate that you can achieve at least 60% of the marks available in the assessment.

2.4 Opportunities for reassessment

Usually, you will be given one attempt to pass an assessment with one reassessment opportunity.

Your centre will also have a policy covering 'exceptional' circumstances, for example if you have been ill for an extended period of time. Each case will be considered on an individual basis and is at your centre's discretion (usually via written application), and they will decide whether or not to allow a third attempt. Please contact your tutor for details regarding how to apply.

3 Section 1: Introduction to differentiation

3.1 Introduction to this section

What this section is about

By the end of this section you will understand the way in which the concept of a gradient is related to differentiation.

Outcomes, aims and objectives

This section is not examinable in Mathematics for Engineering 2, but contains essential background information to aid understanding of subsequent sections. It covers the following topics:

- the concept of gradient at a point;
- calculating a derivative from first principles;
- calculating a gradient at a point;
- the notation of differentiation;
- the relationship between differentiation and rate of change.

Approximate study time

2 hours.

Other resources required

- Pen, pencil, ruler.
- Folder, loose-leaf paper.
- Scientific calculator.

3.2 Assessment information for this section

How you will be assessed

This section covers essential background material but is not assessed.

3.3 Introduction to differentiation

Differentiation is a process, part of the branch of mathematics called calculus, which finds the gradient, or steepness, of a graph.

We will explore gradient initially, then how to differentiate from first principles.