SQA Advanced Diploma in Electronic Engineering

GM5D 48

Course Tutor Guide (International)

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Acknowledgements

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

Further information

Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

History of changes

It is anticipated that changes will take place during the life of the qualification and this section will record these changes. This document is the latest version and incorporates the changes summarised below. Centres are advised to check SQA Connect to confirm they are using the up-to-date qualification structure.

NOTE: Where a Unit is revised by another Unit:

- No new centres may be approved to offer the Unit which has been revised.
- Centres should only enter candidates for the Unit which has been revised where they are expected to complete the Unit before its finish date.

Version number	Description	Date

Contents

1 Introduction

1.1 Purpose of Course Tutor Guide

This Guide is aimed at staff in SQA Approved Centres who are responsible for the SQA Advanced Diploma in Electronic Engineering. It will assist you in the delivery, assessment and internal verification of the SQA Advanced Diploma by providing information on setting up a course, the course framework, centre support with course delivery, teaching plans and guidance on assessment of the Units within the course. It also provides information about Core Skills, Graded Units, Quality Assurance and Verification.

2 Setting up the course

Centres will have been approved to offer this course and will have internal processes for liaising with appropriate parties. Liaison with SQA is normally via the centre's SQA Co-ordinator.

It is recommended that a Course Team is set-up by the Institution/Department appointed to oversee the delivery of the course. The Course Team should comprise of all tutors teaching on the course and one tutor should be nominated as Course Team Leader.

The Course Team would have the responsibility for overseeing the quality of delivery on the course and to ensure that academic standards are maintained. The Course Team would also be responsible for monitoring student progress and determining the support required for individuals who are not progressing well.

The Course Team should meet to discuss matters relating to course delivery, assessment and internal verification on a regular basis (usually two/three times a year) to ensure that any action points are achieved and that the course is delivered efficiently and effectively. It is good practice to maintain a record of such meetings to ensure that any action points are noted and accomplished. This will benefit centres and their students by ensuring that all students achieve their full potential while maintaining the appropriate standards.

It is good practice for centres to maintain a library of master folders for each of the Units within the course — these may be stored electronically as long as all relevant staff have access to them as and when required. Electronic files on a secure part of the centre's network/intranet are particularly appropriate if the award is delivered across different campuses allowing all tutors to access the most up-to-date materials wherever they are located.

The master folders should contain Unit specifications, teaching materials (including details of learning, teaching and assessment plans; and if appropriate, details of any integration across Units of either teaching or assessment), assessment exemplars and re-assessments. This enables new members of staff to access this valuable resource prior to, and during, delivery of the course.

It is good practice for tutors to familiarise themselves with the Units and specific requirements of the assessments prior to the start of the course. Unit specifications set out the statement of standards and evidence required for achieving each Unit, along with guidance on content and assessment. Assessment exemplars provide an instrument of assessment for each Unit and suggested marking scheme. **The assessment exemplars MUST be kept secure at all times.**

All tutors delivering this course have a collective responsibility to ensure that all students are supported in a manner that meets their individual needs as they progress through the course.

3 The SQA Advanced Diploma Structure

3.1 General SQA Advanced Diploma Qualification Framework

To be awarded an SQA Advanced Diploma, the student is required to achieve **30 SQA Credits** with a mixture of SCQF level 7 and Level 8 Units.

Each Unit is assigned an **SQA Credit** value of either 1 or 2. This credit value is based approximately on 80 hours of study per credit which consists of 40 hours of structured learning and a further 40 hours of student led study to consolidate and reinforce learning.

Each Unit is also assigned a **Scottish Credit and Qualifications Framework (SCQF) level and credit point value.** (See below for further details regarding the SCQF).

Each Unit is assigned an agreed number of SCQF credit points. One point represents a notional 10 hours of study by the learner at the identified level.

3.1.1 The Scottish Credit and Qualifications Framework (SCQF)

The SCQF has 12 levels ranging from National 1 at SCQF level 1, up to Doctorate at level 12. The different levels indicate the level of difficulty of a particular qualification and the difference between levels is dependent on factors such as:

- the complexity and depth of knowledge and understanding.
- links to associated academic, vocational or professional practice.
- the degree of integration, independence and creativity required.
- the range and sophistication of application/practice.
- the role(s) taken in relation to other learners/workers in carrying out tasks.

3.1.2 SCQF level Descriptors

The SCQF level Descriptors outline the general Outcomes of learning at SCQF levels under five broad headings:

- Knowledge and understanding (mainly subject based)
- Practice (applied knowledge and understanding)
- Generic cognitive skills (eg evaluation, critical analysis)
- Communication, numeracy and IT skills; and
- Autonomy, accountability and working with others

The Descriptors allow broad comparisons to be made between the Outcomes of any learning and allow learners, employers and the public in general to understand the range of skills and learning that should be achieved at each level. SCQF levels are increasingly used in job advertisements to help employers articulate the skills they require for a particular role and to help potential employees to highlight their skills thus ensuring the right person gets the right job.

For SQA Advanced Diploma courses each Unit is also assigned an SCQF level which will be 6, 7 or 8.
These levels indicate the degree of difficulty of the work for that Unit.

SCQF level 6 is approximately equivalent to sixth year of compulsory secondary education. SCQF level 7 is approximately equivalent to first year of degree level study and SCQF level 8 approximately equivalent to second year of degree level study.

SCQF level 7 might be given to an introductory Unit in a subject area and SCQF level 8 to the continuing Unit.

Tutors involved in the delivery and assessment of Units would find the SCQF level descriptors helpful in determining the appropriate level of difficulty/complexity required.

For example:

The Unit *Engineering Mathematics* 1 (HP48 46) has an **SQA Credit value of 1.** This represents 80 hours of teaching and learning.

This 80 hours will equal **8 SCQF points** (1 point = 10 hours of learning) at **SCQF level 6**.

The Unit *Engineering Mathematics 2* (HP49 47) follows on from *Mathematics for Engineering* 1 (HP48 46)) and has an **SQA Credit value of 1.** This represents 80 hours of teaching and learning.

This 80 hours will equal **8 SCQF points** at **SCQF level 7**.

This means that the Unit progresses the student's learning to a higher level.

The Unit *Analogue Electronic Principles* (HP47 47) has an **SQA Credit value of 2** This represents 160 hours of teaching and learning.

This 160 hours will equal **16 SCQF points** (1 point = 10 hours of learning) at **SCQF level 7**.

The Unit *Active Electronic Circuits* (HP3D 48) follows on from *Analogue Electronic Principles* (HP47 47)) and has an **SQA Credit value of 1.** This represents 80 hours of teaching and learning.

This 80 hours will equal **8 SCQF points** at **SCQF level 8**.

This means that the Unit progresses the student's learning to a higher level.

3.2 Core Skills

The Core Skills are a group of five skills that are key to learning and working in today's world. Employers have identified Core Skills as those that are most likely to be needed in any work environment. This does not mean that every job will need people who are proficient in all five Core Skills but it does mean that every job will require some level of ability in some or all of these skills.

The five Core Skills are: *Communication, Numeracy, Information and Communication Technology (ICT), Problem Solving* and *Working with Others.* Each Core Skill is available at levels 2 to 6 of the Scottish Credit and Qualifications Framework (SCQF). A brief description of each Core Skill is detailed below. A fuller description of each Core Skill at the SCQF levels 2–6 is available on the SQA's website: **http://www.sqa.org.uk/sqa/37801.html**

3.2.1 Communication

Communication skills underpin almost all personal, social, learning, and working activity. They are essential in clarifying one's own thoughts, in interacting and conversing with others, in expressing thoughts and in conveying information, feeling and opinions.

The Core Skill in *Communication* has two components:

- Oral Communication
- Written Communication

3.2.2 Numeracy

Numeracy skills are necessary for coping with the demands of everyday life, including work and study. People need to be comfortable with numbers, and with graphs, symbols, diagrams and calculators.

The Core Skill in *Numeracy* has two components:

- Using Graphical Information
- Using Number

3.2.3 Information and Communication Technology (ICT)

Information and Communication Technology (ICT) focuses on the ability to use Information Technology (IT) to process information in ways which will be useful in work and in the home — it is not about developing IT specialists.

The Core Skill in *Information and Communication Technology (ICT)* has two components:

- Accessing Information
- Providing/Creating Information

3.2.4 Working with Others

Working with Others develops the skills needed to co-operate with others in learning and working situations to identify and achieve shared goals.

The Core Skill in *Working with Others* has two components:

- Working Co-operatively with Others
- Reviewing Co-operative Contribution

3.2.5 Problem Solving

Problem Solving develops the skills needed for tackling issues and problems in personal, social, vocational and occupational contexts.

The Core Skill in *Problem Solving* has three components:

- Critical Thinking
- Planning and Organising
- Reviewing and Evaluating

All qualifications offered by SQA are evaluated against the Core Skill framework and where opportunities exist to develop and/or achieve a Core Skill (embedded), these have been noted and a table is provided for each SQA Advanced Diploma showing where these skills are embedded and/or developed.

3.3 Graded Units

In the framework of every SQA Advanced Diploma there are 3 SQA Credits of Graded Unit. There are Graded Units built into the framework towards the latter part of Year 1 and Year 2. Depending on the SQA Advanced Diploma, there may be three individual Graded Units of 1 SQA Credit or there may be two Graded Units — a 1-credit Unit and a 2-credit Unit. The purposes of Graded Units are to:

- demonstrate that the student has achieved the principal aims of the Group Award.
- demonstrate the candidate's ability to integrate the knowledge and understanding gained from other Units making up the Group Award.
- grade student performance.

Graded Units are specific to the Group Award being delivered, and reflect the principal aims of that Group Award. This means that they will also clearly reflect the uniqueness of the title of the Group Award.

The allocation of grades awarded are as follows:

- Grade A — Student has achieved a mark of 70% or above
- Grade B — Student has achieved a mark of between 60% and 69%
- Grade C — Student has achieved a mark of between 50% and 59%
- F (Fail) — Student has failed to reach the required standard and achieved a mark less than 50%

4 SQA Advanced Diploma in Electronic Engineering

4.1 Target audience

The SQA Advanced Diploma in Electronic Engineering develops skills and knowledge in a range of electronic, electrical, engineering, telecommunications, information technology, business awareness, problem solving, information and communication technology areas and interpersonal skills.

The SQA Advanced Diploma in Electronic Engineering is designed to lead to employment as an electronic development engineer, test technician, installation and/or maintenance engineer or similar position in a related industry.

Successful students should be able to progress to a range of degrees.

4.2 Access to the course

As with all SQA qualifications, access will be at the discretion of the centre and the following recommendations are for guidance only. It should be noted that this qualification will be taught and assessed in English.

Some examples of appropriate formal entry qualifications are specified overleaf. They are not exhaustive or mutually exclusive and may be offered in a variety of combinations.

- An appropriate level of skill in the English language.
- Experience in the use of IT applications software.
- Different combinations of relevant National Qualifications, Vocational Qualifications and equivalent qualifications from other awarding bodies may be acceptable, as would suitable industry standard qualifications at an appropriate level.
- Mature students with suitable work experience will be accepted for entry provided the enrolling centre believes that the student is likely to benefit from undertaking the award.

4.3 Aims of course

The SQA Advanced Diploma in Electronic Engineering has a range of aims relating to academic and vocational progression. These are:

The **general** aims of the SQA Advanced Diploma in Electronic Engineering are to:

- Enhance candidates' employment prospects.
- Support candidates' Continuing Professional Development and career development.
- Enable progression within the SCQF (Scottish Credit and Qualifications Framework).
- Develop candidates' ability to apply analysis and synthesis skills to the solution of electronic problems.
- Develop learning and transferable skills.
- Develop candidates' knowledge and skills in planning and project management.
- Develop investigation skills.

The **specific** aims of the SQA Advanced Diploma in Electronic Engineering are to:

- Provide an award that will allow candidates to work now, or in the future, as electronic technicians or incorporated electronic engineers.
- Provide an award that creates a route towards meeting the academic requirements for Incorporated Engineer status.
- Develop a range of Communication and Information Technology knowledge and skills relevant to the needs of electronic incorporated engineers.
- Develop knowledge, understanding and skills in a range of core electrical, analogue electronics and digital electronics principles and technologies at SQA Advanced level (all underpinned by a mandatory Unit in Mathematics).

- Develop knowledge, understanding and skills to apply a structured approach to high level language or assembly language programming.
- Allow a degree of specialisation within areas such as: electronic and electrical principles, electronic construction and testing skills, printed circuit board design, manufacture and test, Programmable Logic Controllers, implementation of local area networks, and other topics included in the curriculum.
- Develop an award that on successful completion will allow candidates to progress to a degree in Electronics or related subject discipline area.
- Develop knowledge and understanding of the external and internal factors that influence the performance of modern companies.

4.4 SQA Advanced Diploma in Electronic Engineering Framework

The table below shows the whole framework of Units for the SQA Advanced Diploma in Electronic Engineering and includes their SQA Credit value and SCQF level.

Unit name	Unit code	Credit value	SCQF level
Communication: Practical Skills	HP4A 47	1	7
Information Technology: Applications Software 1	HP6L 47	1	7
Business Awareness and Continuing Professional Development	HP3H 48	1	8
Engineering Mathematics 1	HP48 46	1	6
DC and AC Principles	HP46 47	1	7
Analogue Electronic Principles	HP47 47	2	7
Combinational Logic	HP3G 47	1	7
Sequential Logic	HP3Y 47	1	7
High Level Engineering Software	HP41 47	1	7
Electronic Testing Skills	HP3M 47	1	7
Electronic Construction Skills	HP3K 47	1	7
Electrical Networks and Resonance	HP3J 47	1	7
Telecommunications Fundamentals	HP40 48	1	8
Engineering Mathematics 2	HP49 47	1	7
Active Electronics Circuit	HP3D 48	1	8
Power Supply Circuits	HP3T 48	1	8
MSI Devices	HP3R 48	1	8
Programmable Logic Devices	HP3W 48	1	8
High Level Language: External I/O Transfer	HP43 48	1	8
Field Programmable Gate Arrays	HP3N 48	1	8
Printed Circuit Board Design, Manufacture and Test	HP3V 47	1	7
MCU/MPU Assembly Language Programming	HP42 47	1	7
Applications of Signal Processing and Conditioning	HP3F 48	1	8
Electronic Fault Finding	HP3L 48	1	8
Implementing Small Local Area Networks	HP3P 47	1	7
Applications of Programmable Logic Controllers	HP3E 47	1	7
Electronics: Group Award Graded Unit 1 — Examination	HP44 47	1	7
Electronics: Group Award Graded Unit 2 — Practical Project	HP45 48	2	8

4.5 Core Skills

All of the revised Units within this award have been assessed and validated against the Core Skills framework.

Successful students will exit from the SQA Advanced Diploma in Electronic Engineering with the following Core Skills profile:

Core Skill	**Certificated exit level**
Communication	Oral and Written Communication at SCQF level 6
Numeracy	Using Number at SCQF level 6
Information and Communication Technology (ICT)	Using Information Technology at SCQF level 6
Problem Solving	Problem Solving at SCQF level 6
Working with Others	Development Opportunities

4.6 Graded Unit

Students will take a 1-credit Graded Unit at SCQF level 7 in the first year of the SQA Advanced Diploma Group Award, and a further 2-credit Graded Unit at SCQF level 8 in the second year of the SQA Advanced Diploma Group Award.

The Graded Units take the form of:

Electronics: Group Award Graded Unit 1 HP44 47 Examination at SCQF level 7 — 1 SQA Credit

Electronics: Group Award Graded Unit 2 HP45 48 Practical Project at SCQF level 8 — 2 SQA Credits

The purpose of the Graded Units in SQA Advanced awards is to assess candidates' ability to apply and integrate Knowledge and/or Skills developed in individual Units in order to demonstrate that they have achieved the principal aims of the award. Graded Units allow for the grading of candidate achievement.

Electronics: Group Award Graded Unit 1 HP44 47, is a 1-credit Unit levelled at SCQF level 7. It consists of a three hour examination which must be conducted under controlled, supervised conditions. The examination paper comprises six, 25 mark questions of which the candidate should answer any four. Each question should include a measure of integration from two of the following three Electronic subject areas: Analogue Electronics, Digital Electronics and Electronics and Electrical Principles. The examination will be unseen and closed-book. The specification for the examination is detailed in the Unit specification.

Electronics: Group Award Graded Unit 2 HP45 48, is a 2-credit Unit levelled at SCQF level 8. The Graded Unit consists of a Project (Practical Assignment) which must involve the construction of some form of product (either hardware, hardware and software or software). Where the product is only software, the candidate must demonstrate that the software can drive a piece of hardware. While the Graded Unit involves a practical electronics project, drawing from one or more technical areas, it also provides opportunities to apply and integrate non-technical knowledge and skills. Thus, the Graded Unit provides candidates with opportunities to develop and integrate skills in such areas as project planning and management, investigation, practical electronic skills, developing and testing systems, oral and written communication and evaluation. Candidates must prepare a written report and undertake an oral presentation as part of the Graded Unit. Details are given in the Unit specification.

5 Course delivery of an SQA Advanced Diploma

5.1 How the course is delivered

All tutors must ensure that they deliver this course using teaching methods that engage students in 'active learning' to encourage them to participate in the learning activities set. All SQA qualifications are designed to enable students to develop their knowledge and skills and then they are required to apply this new knowledge/skill to a new situation. Criterion-referenced assessments assume that all parties are fully informed of the criteria that students must achieve and the assessment conditions under which the students carry out the assessment activity.[1]

To ensure that students are fully prepared it is essential that tutors provide as many opportunities as possible for students to be actively engaged throughout the learning process. Students should:

- be fully informed of the criteria they must achieve.
- be offered a range of learning activities to research, analyse and apply new knowledge/skills to new situations.
- be offered opportunities to experience the type of activity that they will be required to carry out as part of the summative assessment.
- be able to critically evaluate their personal contribution and to receive feedback from the tutor on how to enhance their understanding.

Tutors should develop a learning, teaching and assessment plan for each Unit within the course and provide activities that students should undertake.

[1] For further information about different assessment activities — whether they be for formative or summative purposes, tutors may wish to complete the new online course: Produce SQA Advanced Diploma Assessments for successful prior verification and/or read the SQA Guide to Assessment

Each Unit should have a master folder containing the Unit specification, teaching materials, the teaching and assessment plan along with assessment exemplars and re-assessments. The teaching materials and teaching plan should provide details of activities that students should undertake. Typically they include activities such as small group/whole class discussion, group problem solving, eg analysing a case study and offering solutions based on the new learning, group project work to find examples, to research new knowledge and to present their findings to their fellow students.

The following is a list of learning activities but it is not exhaustive:

- Lectures
- Tutorials
- Study packs
- Problem based scenarios
- Case studies
- Group/team work
- Online materials
- IT based teaching materials
- Projects
- Quizzes
- Research and presentation of findings to fellow students
- Role play
- Short response questions, multiple choice questions
- Create questions for other students (with answers), etc

Tutors should consider the nature of the assessment method as well as the assessment content when planning learning activities so that students are appropriately prepared.

It is the tutor's responsibility to explain to the students what is required of them and then to direct, encourage, co-ordinate and support students to complete the activity. It is also the tutor's responsibility to ensure the resources needed are available to the students. Materials should be reviewed on a regular basis to ensure they are still relevant.

Some activities could require students to work in pairs or small groups to discuss issues or to solve a given problem. Other activities could require the student to undertake some independent research out with the classroom and to bring their findings to the next lesson and present this to the class in a report or presentation format. Some Units will require the student to undertake independent reading and students should be prepared to discuss key issues within the classroom as organised and led by the tutor.

In practical skills classes, students should be directed to use practice exercises to enable them to become proficient. Tutors may demonstrate the skill first and then coach the students individually when unsure. In terms of developing independent learners, in the case of information technology, students should be encouraged to independently use the online Help facilities within applications. It should be noted that even in practical classes, students should be encouraged to work in small groups and to support one another as part of the learning process — by explaining to another, a student has to reformulate and communicate the learning point thus deepening their learning.

When undertaking group work, students should be encouraged/directed to work with different groups each time they attempt a new task so that they get to know and work with a wide range of individuals. The groups should be given clear task activities. Tutors should note the various roles assigned to the group members and they should set a time limit for the completion of the task.

At the end of each activity tutors should make time to receive feedback from each group so that they can assess knowledge and understanding and use the feedback session to repeat important key points and to clear up any misunderstandings. Tutors must also provide feedback to students on their performance in activities, etc.

Where centres have access to electronic resources such as Virtual Learning Environments, Blogs, Wikis, etc — tutors/lecturers are encouraged to use these collaborative tools in the learning process.

5.2 Support for students

All tutors delivering on a course have a collective responsibility to ensure that all students are supported in a manner that meets their individual needs as they progress through the course.

Each individual tutor has a role to monitor an individual student’s understanding and progress at Unit level and feed comments to the Course Team. At individual Unit level, tutors may wish to use a range of mechanisms to support students and to establish if students are progressing well on the course.

6 SQA Advanced Diploma in Electronic Engineering course delivery

6.1 Teaching plan

The Units that make up this Group Award are listed in Section 6.2 — ***Overview of Units.***

This Section — ***Teaching plan*** — provides a ***suggested*** delivery schedule for the Units and highlights the best way to sequence the Units over two years.

When constructing this teaching plan consideration was given to the following points:

- Year 1 will contain Units which are mainly at SCQF level 6/7.
- Year 2 will contain Units which are mainly at SCQF level 7/8 and there should be a natural progression from some of the Units delivered in Year 1 to those being delivered in Year 2.
- Some Units are 2-credit and thought must be given as to whether the Unit should be covered in one semester or across the whole year.
- Finally, the Graded Units completed at the end of Years 1 and 2 are based on some of the mandatory Units. The Units being assessed as part of the Graded Unit, must be delivered and assessed to ensure that sufficient learning will have taken place to enable the students a fair opportunity at achieving the Graded Unit at an appropriate grade.

Students will study 15-credits worth of Units in each year. One semester will have 7 credits and one semester 8 credits. The weighting of these Units will depend on the relationship of the relevant Unit with other Units in terms of prior knowledge needed and/or complementary knowledge.

Rationale for the suggested delivery schedule

Two suggested delivery schedules have been given for Year 1 and Year 2 of the SQA Advanced Diploma in Electronic Engineering — Option A and Option B.

The majority of the SCQF level 7 Units have been included in Year 1, so that students are provided with introductory knowledge and understanding in the subject areas of electronic, electrical and related engineering areas.

The majority of the Units in Year 2 are SCQF level 8 Units that will develop further the knowledge and understanding gained in Year 1. Students will be able to extend their knowledge and skills in the subject areas of electronic, electrical and related engineering areas.

6.1.1 Year 1: Suggested delivery schedule

SQA Advanced Diploma in Electronic Engineering YEAR 1 — Option A

Semester 1	Semester 2
HP4A 47 Communication: Practical Skills level 7/1 credit	HP3Y 47 Sequential Logic level 7/1 credit
HP48 46 Engineering Mathematics 1 level 6/1 credit	HP3J 47 Electrical Networks and Resonance level 7/1 credit
HP46 47 DC and AC Principles level 7/1 credit	HP3M 47 Electronic Testing Skills level 7/1 credit
HP47 47 Analogue Electronic Principles level 7/2 credits	HP3E 47 Applications of PLCs. level 7/1 credit
HP3K 47 Electronic Construction Skills level 7/1 credit	HP3V 47 PCB Design, Manufacture and Test level 7/1 credit
HP3G 47 Combinational Logic level 7/1 credit	HP41 47 High Level Engineering Software level 7/1 credit
HP6L 47 IT: Applications Software 1 level 7/1 credit	HP44 47 Graded Unit 1: Examination level 7/1 credit

Rationale for SQA Advanced Diploma in Electronic Engineering YEAR 1 — Option A

The Units are sequenced, in Option A, in such a way as to build knowledge in terms of breadth across all key areas of study, and to introduce elements of practical skills at appropriate points within the programme. This will give candidates a clear understanding of the range of skills involved in the industry as well as provide suitable preparation for HP44 47 *Graded Unit 1: Examination*.

Key features of SQA Advanced Diploma in Electronic Engineering YEAR 1 — Option A

The key features of Year 1 Option A include:

- Relevant mathematical skills to understand the engineering concepts employed
- Relevant Communication skills in order to provide suitable reports for assignments
- Relevant Information Technology skills in order to support the creation of technical reports for assignments
- A range of electrical principles necessary to understand the key concepts in electrical and electronic engineering
- An introduction to the different fields of electronics such as analogue, digital and programmable technologies
- A range of practical skills to support the engineering principles
- Preparation for HP44 47 *Graded Unit 1: Examination*

YEAR 1 — Option B

Semester 1	Semester 2
HP4A 47 Communication: Practical Skills level 7/1 credit	HP3Y 47 Sequential Logic level 7/1 credit
HP48 46 Engineering Mathematics 1 level 6/1 credit	HP3J 47 Electrical Networks and Resonance level 7/1 credit
HP46 47 DC and AC Principles level 7/1 credit	HP3M 47 Electronic Testing Skills level 7/1 credit
HP47 47 Analogue Electronic Principles level 7/2 credits	HP3E 47 Applications of PLCs level 7/1 credit
HP3K 47 Electronic Construction Skills level 7/1 credit	HP40 48 Telecommunications Fundamentals level 8/1 credit
HP3G 47 Combinational Logic level 7/1 credit	HP49 47 Engineering Mathematics 2 level 7/1 credit
HP6L 47 IT: Applications Software 1 level 7/1 credit	HP44 47 Graded Unit 1: Examination level 7/1 credit

Rationale for SQA Advanced Diploma in Electronic Engineering YEAR 1 — Option B

The Units are sequenced similar to those in Option A in order to prepare candidates for HP44 47 Graded Unit 1: Examination and to provide suitable knowledge across all key areas of study, as well as to introduce elements of practical skills at appropriate points within the programme. The main difference with Option B is that it also provides opportunities for further studies in mathematics and also introduces telecommunications into the programme.

Key features of SQA Advanced Diploma in Electronic Engineering YEAR 1 — Option B

The key features of Year 1 Option B include:

- Relevant mathematical skills to understand the engineering concepts employed for Year 1 and Year 2 of the SQA Advanced Diploma
- Relevant Communication skills in order to provide suitable reports for assignments
- Relevant Information Technology skills in order to support the creation of technical reports for assignments
- A range of electrical principles necessary to understand the key concepts in electrical and electronic engineering
- An introduction to the different fields of electronics such as analogue, digital, telecommunications and programmable technologies
- A range of practical skills to support the engineering principles
- Preparation for HP44 47 *Graded Unit 1: Examination*

6.1.2 Year 2: Suggested delivery schedule

YEAR 2 — Option A

Semester 1	Semester 2
HP3D 48 Active Electronic Circuits level 8/1 credit	HP3L 48 Electronic Fault Finding level 8/1 credit
HP3H 48 Business Awareness and CPD level 8/1 credit	HP3N 48 Field Programmable Gate Arrays level 8/1 credit
HP42 47 MCU/MPU Assembly Language Programming level 7/1 credit	HP43 48 High Level Language: External I/O Transfer level 8/1 credit
HP3T 48 Power Supply Circuits level 8/1 credit	HP3F 48 Applications of Signal Processing and Conditioning level 8/1 credit
HP49 47 Engineering Mathematics 2 level 7/1 credit	HP40 48 Telecommunications Fundamentals level 8/1 credit
HP3R 48 MSI Devices level 8/1 credit	HP3P 47 Implementing Small Local Area Networks level 7/1 credit
HP3W 48 Programmable Logic Devices level 8/1 credit	HP45 48 Graded Unit 2: Practical Project level 8/2 credits

Rationale for SQA Advanced Diploma in Electronic Engineering YEAR 2 — Option A

Option A Year 2 provides a more in depth treatment of the disciplines introduced in Year 1 and introduces further topics such as Programmable Logic Devices. One of the key decisions is to place Maths for Engineering 2 in Semester 2 if it is felt necessary to course content or to leave it until Semester 2 if only required for upward articulation. Another feature of Option A is to leave Graded Unit 2 until Semester 2 in order to concentrate delivery.

Key features of SQA Advanced Diploma in Electronic Engineering YEAR 2 — Option A

The key features of Year 2 Option A include:

- Inclusion of Engineering Mathematics 2 in Semester 1 for consolidation of analytical skills if required by other Units.
- The introduction of programmable devices and assembly language programming in Semester 1 leading to higher level skills in Semester 2.
- The delivery of Graded Unit 2 entirely in Semester 2 in order to concentrate delivery.

- The delivery of Electronic Fault Finding in Semester 2 to run in parallel with Graded Unit 2.

YEAR 2 — Option B

Semester 1	Semester 2
HP3D 48 Active Electronic Circuits level 8/1 credit	HP3L 48 Electronic Fault Finding level 8/1 credit
HP3H 48 Business Awareness and CPD level 8/1 credit	HP3N 48 Field Programmable Gate Arrays level 8/1 credit
HP42 47 MCU/MPU Assembly Language Programming level 7/1 credit	HP43 48 High Level Language: External I/O Transfer level 8/1 credit
HP3T 48 Power Supply Circuits level 8/1 credit	HP3F 48 Applications of Signal Processing and Conditioning level 8/1 credit
HP41 47 High Level Engineering Software level 7/1 credit	HP3V 47 PCB Design, Manufacture and Test level 7/1 credit
HP3R 48 MSI Devices level 8/1 credit	HP3P 47 Implementing Small Local Area Networks level 7/1 credit
HP3W 48 Programmable Logic Devices level 8/1 credit	HP45 48 Graded Unit 2: Practical Project level 8/1 of 2 credits
HP45 48 Graded Unit 2: Practical Project level 8/1 of 2 credits	

Rationale for SQA Advanced Diploma in Electronic Engineering YEAR 2 — Option B

Option B Year 2 is similar to option A in that it provides a more in depth treatment of the disciplines introduced in Year 1 and introduces further topics such as Programmable Logic Devices. However, Engineering Mathematics 2 was delivered in Semester 2 of Year 1 in order to leave room in Year 2 for more engineering content. Another difference is that Graded Unit 2 is now spread over the entire academic year instead of over one semester which can have benefits for certain candidates

Key features of SQA Advanced Diploma in Electronic Engineering YEAR 2 — Option B

The key features of Year 2 Option B include:

- The introduction of programmable devices and assembly language programming in Semester 1 leading to higher level skills in Semester 2.
- The delivery of Graded Unit 2 spread over the entire academic session in order to allow candidates more time for preparation.
- The delivery of Electronic Fault Finding in Semester 2 to allow candidates to fault find on projects if required.

6.2 Overview of Units

An overview of each Unit delivered within Years 1 and 2 is given below. However, tutors should refer to the Unit specification for full details of the Knowledge and/or Skills to be covered and Evidence Requirements. The Evidence Requirements clearly state the type of evidence required, the standard of evidence required and any conditions of assessment. The Unit specification also contains guidance on the delivery and assessment of the Unit.

NOTE: Information regarding both Graded Units is given in Section 4.6.

HP4A 47: Communication: Practical Skills. This Unit is about applying practical communication skills to complex issues in a vocational context. It provides knowledge and skills in interpreting written information on a complex vocational issue, producing written information on a complex vocational issue and contributing to a formal group discussion on a complex vocational issue.

HP48 46: Engineering Mathematics 1. This Unit is designed to enable candidates to know, understand and apply algebraic techniques to manipulate expressions and solve equations commonly found in engineering. It provides candidates with an opportunity to develop the knowledge and skills to carry out operations involving complex numbers. The Unit also allows candidates the opportunity to develop the necessary knowledge and skills to analyse trigonometric functions and their graphs.

HP46 47: DC and AC Principles. This Unit is designed to enable candidates to develop knowledge and understanding and apply basic electrical concepts and theorems to the solution of simple electrical problems. The Unit also allows candidates the opportunity to develop the necessary knowledge and skills to solve single-phase ac circuit problems using complex notation.

HP47 47: Analogue Electronic Principles. This Unit is designed to give candidates knowledge and understanding to demonstrate a wide range of discrete and integrated circuit analogue electronic devices. It will also provide candidates with the underpinning knowledge to further their studies in analogue electronics at a higher level.

HP3G 47: Combinational Logic. This Unit is designed to enable candidates to gain knowledge and understanding and apply basic digital concepts applicable to combinational logic circuits. It provides candidates with an opportunity to develop the

knowledge and skills to be able to design and construct combinational logic circuits to meet a design brief.

HP3K 47: Electronic Construction Skills. This Unit introduces the candidate to electronic components and their circuit symbols as used in analogue and digital circuit diagrams. It provides opportunities for the candidate to simulate ac and dc circuits and to test their function by means of simulated test equipment. It allows the exploration of circuit construction techniques and enables the candidate to use some of the techniques to build and test ac and dc circuits. The ultimate purpose of the Unit to is to develop the candidates' skills of simulating, building and testing circuits.

HP6L 47: Information Technology: Applications Software. This Unit is designed to enable students to use Information Technology (IT) systems and applications independently to support a range of information processing activities. The Unit is designed to develop a broad knowledge of the theoretical concepts, principles, boundaries and scope of IT applications. These activities will be centred on using software applications packages to meet complex information requirements while paying attention to security and the needs of other users.

HP3Y 47: Sequential Logic. The purpose of this Unit is to provide candidates with the necessary knowledge to understand the organisation of sequential logic devices and circuits, develop skills to design, simulate, build and test sequential logic circuits.

HP3M 47: Electronic Testing Skills. This Unit is designed to enable candidates to gain knowledge of standard electronic test instruments and testing techniques. In addition, candidates will gain the opportunity to practice basic fault finding techniques.

HP41 47: High Level Engineering Software. This Unit is designed to give candidates knowledge and understanding and apply basic software engineering concepts to solving electrical and electronic engineering problems that require a software solution. The emphasis in this Unit is on writing and testing I/O programs using the basic structures available in most high level languages. It provides the candidates with the opportunity to develop skills in system design (top-down design), detailed design (using flow charts or program design language), implementation in the design in a high level language and verification of the design.

HP3V 47: Printed Circuit Board Design, Manufacture and Test. This Unit is designed to develop candidates' skills in PCB design, manufacture and test. It also enables candidates to apply instrumentation and testing skills to a practical circuit, comparing results obtained with a given specification.

HP3E 47: Applications of Programmable Logic Controllers. This Unit is designed to introduce candidates to Programmable Logic Controllers (PLCs) and enable them to understand how PLCs are applied to control industrial processes. The Unit allows candidates to develop the necessary knowledge and skills to allow them to understand the basic construction and operation of PLCs. The Unit also provides candidates with the opportunity to develop practical programming skills to enable them to apply a PLC to simulate control of a specified industrial process.

HP49 47: Engineering Mathematics 2. This Unit is designed to give candidates knowledge and understanding and an ability to apply differential and integral calculus to Engineering problems.

HP3H 48: Business Awareness and Continuing Professional Development. This Unit is designed to enable candidates to recognise and evaluate the external factors affecting the performance of companies in the modern business environment. It also provides candidates with the opportunity to identify and assess the internal measures companies are taking in order to respond to external business pressures. The Unit also allows candidates to recognise the importance that continued learning and Continuing Professional Development would play in the development of their careers in a rapidly changing business environment. This recognition is reinforced in that candidates are provided with the opportunity to develop a Continuing Professional Development Action Plan.

HP3J 47: Electrical Networks and Resonance. This Unit is designed to enable candidates to develop knowledge and understanding and apply a range of network theorems to the solution of dc and ac electrical network problems. The Unit also allows candidates to undertake a detailed study of series and parallel electronic and electrical passive resonant circuits that includes the calculation of Q — factor and bandwidth and the plotting of impedance — frequency and current — frequency curves for both series and parallel cases.

HP40 48: Telecommunications Fundamentals. This Unit provides candidates with the knowledge and understanding associated with noise sources, and the various methods of reducing their effects on the performance of electronic circuits. It also identifies and describes the factors affecting electromagnetic compatibility (EMC) and how these can be minimised by good design practice. The Unit also provides the candidate with an understanding of the modulation and demodulation techniques used in the telecommunications industry and applies these methods to explain the function of various RF circuits used in transmitters and receivers.

HP3D 48: Active Electronic Circuits. This Unit is designed to enable candidates to build on the knowledge of Analogue Electronic Principles with regard to further understanding electronic circuits. It will allow the candidate to gain an understanding of feedback and to develop this understanding with regard to a specified list of electronic amplifiers, filters and oscillator circuits. In addition candidates will design a second order filter using a reference table provided. The candidates will be required to perform practical tests on a selection of circuits from the list.

HP3R 48: MSI Devices. The purpose of this Unit is to provide candidates with the necessary skills and knowledge to select and apply specific MSI devices to electronic circuits. This Unit also includes the principles of analogue to digital and digital to analogue conversion and associated devices.

HP3W 48: Programmable Logic Devices. This Unit is designed to enable candidates to gain some knowledge and understanding of the principles and benefits of using programmable logic devices compared to alternatives and to allow the candidates to develop some of the necessary skills required in using the associated design tools.

HP42 47: MCU/MPU Assembly Language Programming. This Unit is designed to give candidates knowledge and understanding and apply a structured approach to the writing of assembly language programs in an engineering environment. The environment best suited to this Unit is a host/target arrangement where the target is a microcontroller/microprocessor Unit (MCU/MPU) development system. Outcome 1 aims to cover microprocessor/microcontroller operation and some relevant architecture. Outcome 2 introduces the idea of a linear program designed to read an input location, process it and output the result. Outcome 3 introduces the concept of branching and looping. Outcome 4 develops the concept of the creating and calling a sub program.

HP3P 47: Implementing Small Local Area Networks. This Unit has been designed to allow candidates to develop an awareness of LAN topologies and network operating systems. It will also allow candidates to assess a customer's requirements and then design, and implement a LAN to suit these specifications.

HP3F 48: Applications of Signal Processing and Conditioning. This Unit is designed to give candidates knowledge and understanding and apply a number of signal processing techniques to the solution of filtering and control problems for implementation on a digital signal processor (DSP), microprocessor, or microcontroller based system. Outcome 1 has been written to introduce the principles of sampling and reconstruction, and through practical experiment deduce the requirement for anti-aliasing and reconstruction filters. Outcome 2 then introduces a variety of approaches to digital filtering, and includes integration and differentiation. Outcome 3 applies signal processing techniques to three-term control.

HP3L 48: Electronic Fault Finding. This Unit is designed to enable candidates to understand the concept of electronic fault finding and enable them to be proficient in designing and implementing a fault location strategy. This Unit is particularly suited for candidates who expect to work as electronic technicians (especially in a maintenance role) but is also relevant to all those on an electronic study programme who require a practical understanding of electronic fault finding.

HP3N 48: Field Programmable Gate Arrays. This Unit is designed to enable candidates to gain some knowledge and understanding of the architecture and technology used within Field Programmable Gate Arrays and to allow the candidates to develop some of the necessary skills required in using the associated design tools.

HP3T 48: Power Supply Circuits. This Unit has been designed to provide an introduction to Power Supply Circuits. It will enable candidates to know and understand the basic concepts of power supplies and allow them to apply and develop this knowledge by constructing and testing a three terminal power supply and a switched mode power supply.

HP43 48: High Level Language: External I/O Transfer. This Unit is designed to enable candidates to gain knowledge and understanding and apply a high level programming language solution to parallel and serial data transfer problems in an engineering environment. It is also intended, with the use of files, to introduce the principles of data logging. This Unit can, with the use of a cross compiler, be applied for the programming of microcontroller/microprocessor devices. The program can first be developed using high level language on the host computer (a PC) then cross-compiled to the object code of the target system. Outcome 1 introduces the principles of parallel data transfer with Outcome 2 concentrating on serial data transfer. Outcome 3 introduces the principles of file creation, reading and closing.

6.3 Opportunities for integration of Units

It is envisaged that where possible centres will deliver this award in an integrative manner to help the students appreciate the interconnections between the various subjects.

Integration means identifying opportunities to combine areas of learning or assessment. This could mean devising one lesson which includes teaching two related topics or devising one assessment task which assesses more than one Outcome. A single assessment task could assess more than one Outcome from a Unit, or could bring Outcomes from different Units together in one task. This approach can reduce the overall number of assessment tasks needed, which is beneficial for students and for tutors.

For example, in the Unit *Communication: Business Communication* (HP4A 47), Outcome 2 requires students to produce complex written business documents (which can be one or more documents) of approximately 1,500 words but which must conform to a range of standards. The content of the ‘complex written business documents’ are not stated and it would, therefore, be possible to select a topic from another Unit, for example, HP6L 47 *Information Technology: Applications Software,* Outcome 2 to form the basis of a ‘formal business report’. Hence two Outcomes are being assessed in a single assessment activity.

Based on the proposed delivery of Years 1 and 2 the following opportunities exist for integration of delivery and/or assessment:

YEAR 1

Unit code	Unit title	Integration opportunity
HP3K 47	Electronic Construction Skills	Assessment integration with HP3M 47 Electronic Testing Skills
HP3G 47	Combinational Logic	Delivery integration with HP3Y 47 Sequential Logic

YEAR 2

Unit code	Unit title	Integration opportunity
HP3L 48	Electronic Fault Finding	Delivery integration with HP45 48 Graded Unit 2: Practical Project
HP3W 48	Programmable Logic Devices	Delivery integration with HP3N 48 Field Programmable Gate Arrays

7 Assessment in an SQA Advanced Diploma award

7.1 Assessment in learning and for certification

Assessment is the process of evaluating a student's learning.

Assessment takes place throughout the learning and teaching processes as well as the final assessment for certification. It can take many forms (for example: practical exercises, case studies, extended response questions) and can be used for different purposes — including identifying prior knowledge, identifying gaps in learning, providing feedback to students as well as measuring student attainment.

Assessment as part of the learning process is called **formative** assessment. It provides developmental feedback to a student and tutors so that they can adjust their plan for future learning. It is not recorded for external purposes. **Formative** assessment is often called 'assessment for learning'.

Summative assessment is carried out for the purpose of certification. Through **summative assessment**, students provide evidence to demonstrate that they can achieve the Evidence Requirements detailed in the statement of standards of the relevant Unit specification. It is generally undertaken at the end of a learning activity or programme of learning and is used to make a judgement on the student's overall attainment.

7.2 Assessment planning of an SQA Advanced Diploma

All SQA Advanced Diploma qualifications are **summatively assessed** using a mix of continuous Unit assessment and Graded Unit assessments. It is helpful for students, the Course Team and the internal verifiers if the Course Team has an overview of when summative assessments are likely to occur. It is, therefore, common practice for a Course Team, prior to the start of course delivery to agree the overall learning, teaching and assessment plan for the course. Part of this process requires tutors to agree when each Unit in the course will be **summatively assessed**.

In situations where Units of a course are being delivered in parallel, it is important that Course Teams make sure that the assessment load placed on students is manageable, although it is recognised that by its very nature summative assessments will occur towards the end of learning.

7.3 Planning the Unit summative assessment

For each Unit, it is helpful for tutors/assessors to draw up a Unit assessment plan which:

- describes what is to be assessed.
- says what assessment methods will be used.
- describes how the assessments are to be administered, eg practical, online, etc.
- defines opportunities for integrating assessment.
- provides a timetable for when the assessment will take place.
- notes arrangements that need to be made to take account of additional support needs or prior learning.
- describes the measures to be taken to ensure that the evidence produced is authentic and current.
- describes how and when requirements for record-keeping and quality assurance processes will be met.

7.4 Negotiating summative assessments with the students

Ultimately, it is up to the tutor to determine when a student is ready for summative assessment (within the agreed time constraints of the course timetable). A good way of gauging if a student is ready for assessment is to use a **practice assessment** (a final formative assessment which mirrors the summative assessment in terms of assessment method and an aspect of the Evidence Requirement where appropriate but it must not contain the same task detail as the summative assessment).

The tutor can use this assessment to identify the level of an individual student's competence and the Outcome can help the tutor determine if the student is ready to attempt the summative assessment or if the student still has gaps in knowledge and understanding that need to be addressed through further work.

It is good practice to communicate assessment plans to students as early as possible in the course so that they know what to expect. A copy of the **proposed Course Assessment Plan** may be given to students at the start of the course, often during course induction. Thereafter, it is up to each tutor to make sure that students receive early warning of when assessment is likely to take place.

7.5 Summative assessment exemplars

Assessment exemplars are produced by SQA and are made available to centres for all of the Units in this SQA Advanced Diploma. Assessment exemplars are intended solely for the purpose of assessment of students against the standards given in the Unit specifications. **They must not be released prior to the assessment or be distributed for any other purpose. It is the centre's responsibility to maintain the security of all assessment exemplars.**

A Unit assessment exemplar will contain:

- details of the conditions under which the assessment is to be carried out.
- assessment tasks for each Outcome.
- a marking scheme or model answer.
- checklists (where appropriate).

It is vital that tutors:

- adhere to the conditions for the assessment, ie open-book, closed-book, controlled conditions.
- mark assessments consistently in line with the marking scheme or model answer provided.
- keep all assessment exemplars secure so that they can be used for future student assessments.

Once the student has completed the summative assessment, it is good practice for tutors to mark their student's work quickly and provide constructive feedback.

8 SQA Advanced Diploma in Electronic Engineering assessment strategy and plan

8.1 SQA Advanced Diploma in Electronic Engineering assessment strategy

A guide to the type and number of assessments in each Unit of the SQA Advanced Diploma in Electronic Engineering is shown below.

<table>
<tr><th>Unit</th><th colspan="4">Assessment — Year 1</th></tr>
<tr><td></td><td>Outcome 1</td><td>Outcome 2</td><td>Outcome 3</td><td>Outcome 4</td></tr>
<tr><td>HP4A 47 Communication: Practical Skills</td><td>Report</td><td>Presentation</td><td>Contribution to group discussion</td><td>N/A</td></tr>
<tr><td>HP48 46 Engineering Mathematics 1</td><td>Closed-book assessment
All three assessments may be integrated</td><td>Closed-book assessment</td><td>Closed-book assessment</td><td>N/A</td></tr>
<tr><td>HP46 47 DC and AC Principles</td><td colspan="2">Closed-book integrated assessment</td><td>N/A</td><td>N/A</td></tr>
<tr><td>HP47 47 Analogue Electronic Principles</td><td>Practical assignment</td><td colspan="3">Closed-book assessment</td></tr>
<tr><td>HP3K 47 Electronic Construction Skills</td><td>Practical assignment</td><td>Practical assignment</td><td>Practical assignment</td><td>Practical assignment</td></tr>
</table>

Unit	Assessment — Year 1 (continued)			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
HP3G 47 Combinational Logic	Closed-book assessment			Practical assignment
HP6L 47 IT: Applications Software 1	Practical assignment	Structured assignment	N/A	N/A
HP3Y 47 Sequential Logic	Closed-book assessment plus design element of LO 3 included in practical assignment for LO 4			Practical assignment
HP3J 47 Electrical Networks and Resonance	Closed-book assessment		N/A	N/A
HP3M 47 Electronic Testing Skills	Practical assignment	Practical assignment	Practical assignment	Practical assignment
HP3E 47 Applications of PLCs	Closed-book assessment		Practical assignment	N/A
HP3V 47 PCB Design, Manufacture and Test	Integrative practical assignment			
HP41 47 High Level Engineering Software	Structured assignment			
HP44 47 Electronics Graded Unit 1	See section 8.3			

Unit	Assessment — Year 2			
	Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**
HP3D 48 Active Electronic Circuits	Closed-book assessment plus practical assignment			
HP3H 48 Business Awareness and CPD	Formal report		Structured plan	N/A
HP42 47 MCU/MPU Assembly Language Programming	Practical assignment and report		Practical assignment and report	
HP3T 48 Power Supply Circuits	Closed-book assessment			Practical assignment
HP49 47 Engineering Mathematics 2	Closed-book assessment	Closed-book assessment	N/A	N/A
HP3R 48 MSI Devices	Closed-book assessment			Practical assignment
HP3W 48 Programmable Logic Devices	Closed-book assessment		Practical assignment	N/A
HP3L 48 Electronic Fault Finding	Closed-book assessment	Practical assignment	Practical assignment	N/A
HP3N 48 Field Programmable Gate Arrays	Closed-book assessment		Practical assignment	N/A
HP43 48 High Level Language: External I/O Transfer	Structured assignment			N/A
HP3F 48 Applications of Signal Processing and Conditioning	Practical assignment	Practical assignment	Practical assignment	N/A
HP40 48 Telecommunications Fundamentals	Closed-book assessment	Closed-book assessment	Closed-book assessment	Closed-book assessment
HP3P 47 Implementing Small Local Area Networks	Closed-book assessment (Outcome 1 plus part of Outcome 2)		Structured assignment (Outcome 3 plus part of Outcome 2)	N/A
HP45 48 Electronics Graded Unit 2	See Section 8.3			

8.2 SQA Advanced Diploma in Electronic Engineering Course Assessment Plan

Suggested course assessment schedules for Year 1 and Year 2 are found in Appendix 2.

They are based on two semesters of 17 weeks; where centres have a different length of semester, they should amend their schedules accordingly.

If centres decide to deliver Units in a different order, they should amend their schedules accordingly.

8.3 SQA Advanced Diploma in Electronic Engineering Graded Unit assessments

Electronics: Group Award Graded Unit 1 HP44 47 is a 1-credit Unit levelled at SCQF level 7.

It consists of a three hour examination which must be conducted under controlled, supervised conditions.

The examination paper comprises six, 25 mark questions of which the candidate should answer any four. Each question should include a measure of integration from two of the following three Electronic subject areas: Analogue Electronics, Digital Electronics and Electronics and Electrical Principles.

The examination will be unseen and closed-book. The specification for the examination is detailed in the Unit specification.

It is recommended that the candidate should have completed, or be in the process of completing, the following Units, which relate to the specific aims of the Group Award, prior to undertaking this Graded Unit:

SQA code	SCQF level	Title
HP47 47	7	Analogue Electronic Principles
HP3G 47	7	Combinational Logic
HP3Y 47	7	Sequential Logic
HP46 47	7	DC and AC Principles
HP4A 47	7	Communication: Practical Skills
HP48 46	6	Engineering Mathematics 1

Electronics: Group Award Graded Unit 2 HP45 48 is a 2-credit Unit levelled at SCQF level 8.

The Graded Unit consists of a Project (Practical Assignment) which must involve the construction of some form of product (either hardware, hardware and software or software). Where the product is only software, the candidate must demonstrate that the software can drive a piece of hardware.

While the Graded Unit involves a practical electronics project, drawing from one or more technical areas, it also provides opportunities to apply and integrate non-technical knowledge and skills. Thus, the Graded Unit provides candidates with opportunities to develop and integrate skills in such areas as project planning and management, investigation, practical electronic skills, developing and testing systems, oral and written communication and evaluation.

Candidates must prepare a written report and undertake an oral presentation as part of the Graded Unit. Details are given in the Unit specification.

It is recommended that the candidate should have completed or be in the process of completing the following Units relating to the above specific aims prior to undertaking this Group Award Graded Unit:

SQA code	SCQF level	Title
HP4A 47	7	Communication: Practical Skills
HP49 47	6	Engineering Mathematics 2
HP46 47	7	DC and AC Principles
HP47 47	7	Analogue Electronic Principles
HP3G 47	7	Combinational Logic
HP3Y 47	7	Sequential Logic
HP3M 47	7	Electronic Testing Skills
HP41 47	7	High Level Engineering Software
or		
HP42 47	7	MCU/MPU Assembly Language Programming

The nature of the project activity detailed in the *Electronics: Graded Unit 2* specification is such that it is likely that centres will wish their candidates to embark on it from the start of the second year of the SQA Advanced Diploma in Electronic Engineering.

8.4 What happens if a student does not achieve an assessment?

If a student fails to demonstrate competence in a summative assessment, it is good practice to communicate this to the student quickly. Tutors should take time to individually feed back to students where they went wrong. Having given feedback, tutors should then advise students on what they need to do to prepare for re-assessment.

The student then undertakes additional work as discussed with the tutor, this is called remediation. It is when the student revises class work or practises skills covered in class BEFORE they attempt the re-assessment. It is important that students do get time to consolidate their knowledge and understanding before being re-assessed.

Re-assessment may take a variety of forms.

- For some assessments, students may be allowed to provide additional information, eg if a student has submitted a report based on a piece of independent research, he/she would be allowed to add the missing evidence and resubmit the report. The new information should be highlighted in such a way to show that it had been added, eg underlined, coloured and dated in the margin.
- For practical tasks related to their use of information technology, students may be permitted to correct work and resubmit — the original submission and the re-submission should both be kept.
- For multiple choice, short response and Graded Units, students may be required to attempt a completely new assessment instrument.

Where specific action has to be taken for re-assessment details will be noted in the Unit specification and tutors must be familiar with the Unit specification requirements for re-assessment.

It is important to note that re-assessment does **NOT** always require that students complete a full new assessment. Re-assessment may (and often does) allow students to re-attempt the part of the Outcome that they have not completed to a standard which meets the Unit specification.

For Units other than Graded Units, SQA provides only **ONE** summative assessment and it is extremely important that centres produce their own **alternativ**e assessments. These assessments can be used for re-assessment purposes.

Once a draft assessment has been prepared by the centre it should first be quality checked by centre staff (internally verified) and submitted to SQA for prior-verification to ensure that it is fit for purpose.[2]

If a student fails to reach the pass mark in the Graded Unit 1 — Examination then he/she should be allowed to sit an alternative examination before the beginning of the next session to allow progression to Year 2. Students must complete all aspects of the new assessment instrument.

[2] For centres wishing support in this process, an online course has been developed — Produce SQA Advanced Unit assessments for successful prior verification

9 Quality Assurance

SQA is committed to providing qualifications and support to match the needs of individuals, society and the economy of Scotland and internationally. SQA believes that global interaction in education and training benefits our customers, clients, partners and SQA through the sharing of expertise and experience.

SQA has a balanced portfolio of qualifications that is inclusive, facilitates progression, reflects Scotland's educational, economic, social and cultural needs and changes, and supports education and training worldwide.

SQA works in partnership with our approved centres to achieve our shared goals of excellence and consistency. This ensures that SQA's qualifications continue to meet the requirements all users of our qualifications.

SQA's quality assurance models are designed to ensure that assessment decisions made to national standards are correct and consistent, and that national standards are maintained. We are committed to maintaining an assessment and quality system that is easy to understand, effectively administered, publicly accountable, and cost-effective to operate.

As well as working with centres to manage and enhance the quality of SQA qualifications, SQA routinely monitors its own performance. SQA establishes processes that need to be followed and submit these to regular auditing. This includes systematic evaluation and review of the effectiveness of our quality management processes. SQA also monitors standards across all our qualifications over time, to ensure consistency. Feedback from stakeholders is an integral part of SQA's review activities.

SQA is subject to external audit by a number of agencies, including the Scottish Government.

For assessed qualifications, SQA regularly monitors centres to ensure that they have the resources and expertise to assess students against the qualification criteria. (Assessment is where centres use assessment instruments to make decisions about students' work. External assessment is where SQA takes on these duties, usually in the form of examinations or externally assessed coursework. Only assessments are subject to quality assurance by verification.)

10 Verification

10.1 Introduction

SQA's quality assurance processes have been developed to ensure that national standards are applied to internally assessed Units or course components.

To maintain the credibility of SQA qualifications, we rely on effective collaboration with centres to ensure national standards are maintained across all qualifications at all levels.

Verification is the procedure that SQA uses to make sure that centres' assessment decisions are valid and reliable and are in line with national standards.

10.2 Why do we need verification?

Verification is one of a range of Quality Assurance measures used by SQA to confirm that:

- centres' assessment decisions are sound (ie valid, reliable and practicable).
- national standards are being uniformly applied.
- assessments are accurately and consistently applied across all students and levels.

This ensures qualifications and certification is credible with all students being assessed to a common standard.

10.3 Internal verification

Centres are responsible for the internal verification of their assessments. This means that centres should have an internal verification system — a system of having quality checks in place — which can be operated throughout the centre. Each tutor who is responsible for the assessment of students and/or internal verification of student material should:

- be made aware of their centre's quality assurance procedures.
- comply with these procedures.

Centres will appoint staff members to be internal verifiers. Internal verifiers will ensure that assessors apply standards of assessment uniformly and consistently. They should keep records of internal verification activity for external verifiers to access. Examples of records include:

- evidence of planned verification for the semester which conforms to the centre's verification strategy.
- minutes of meetings where assessment work is examined and where discussion about acceptable standards is noted and decisions recorded.
- internal verification forms showing which students' work has been verified and the Outcome. Note where an assessor carries out observations, internal verifiers should also observe the assessor.
- evidence of discussion and support of assessors, particularly where student work has not been accepted by the internal verifier.
- evidence of reporting back to the Course Team, any recommendations/actions required and evidence that these are acted upon.

10.4 External verification

To ensure national consistency in assessment decisions, SQA appoints experienced teachers/lecturers who have good, recent experience in the delivery and assessment of their subject to carry out external verification in centres. SQA will notify the SQA Co-ordinator if your centre has been selected for verification.

SQA wants to encourage centres and staff to see verification in a positive light, as a valuable Quality Improvement tool.

Appendix 1a: Core Skills Year 1[3]

Unit code	Unit title	Communication		Numeracy		ICT		Problem Solving			Working with Others	
		Written Communication	Oral Communication	Using Number	Using Graphical Information	Accessing Information	Providing/Creating Information	Critical Thinking	Planning and Organising	Reviewing and Evaluating	Working Co-operatively with Others	Reviewing Co-operative Contribution
HP4A 47	Communication: Business Communication	SCQF 6 E	SCQF 6 E									
HP48 46	Engineering Mathematics 1			SCQF 6 E								
HP46 47	DC and AC Principles											
HP47 47	Analogue Electronic Principles											
HP3K 47	Electronic Construction Skills											
HP3G 47	Combinational Logic											
HP6L 47	IT: Applications Software 1					SCQF 6 E	SCQF 6 E					
HP3Y 47	Sequential Logic											
HP3J 47	Electrical Networks and Resonance											
HP3M 47	Electronic Testing Skills											
HP3E 47	Applications of PLCs.											
HP3V 47	PCB Design, Manufacture and Test											
HP41 47	High Level Engineering Software											
HP44 47	Electronics Graded Unit 1											

[3]S = signposted, E = embedded (**shade as S — yellow and E — green**)

Appendix 1b: Core Skills Year 2[4]

Unit code	Unit title	Communication		Numeracy		ICT		Problem Solving			Working with Others	
		Written Communication	Oral Communication	Using Number	Using Graphical Information	Accessing Information	Providing/Creating Information	Critical Thinking	Planning and Organising	Reviewing and Evaluating	Working Co-operatively with Others	Reviewing Co-operative Contribution
HP3D 48	Active Electronic Circuits											
HP3H 48	Business Awareness and CPD											
HP42 47	MCU/MPU Assembly Language Programming											
HP3T 48	Power Supply Circuits											
HP49 47	Engineering Mathematics 2											
HP3R 48	MSI Devices											
HP3W 48	Programmable Logic Devices											
HP3L 48	Electronic Fault Finding											
HP3N 48	Field Programmable Gate Arrays											
HP43 48	High Level Language: External I/O Transfer											
HP3F 48	Applications of Signal Processing and Conditioning											
HP40 48	Telecommunications Fundamentals											
HP3P 47	Implementing Small Local Area Networks											
HP45 48	Electronics Graded Unit 2											

[4]S = signposted, E = embedded (**shade as S — yellow and E — green**)

Appendix 2a: Year 1, Semester 1 — Assessment Plan (Option A)

Unit Name\Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
HP4A 47 Communication: Practical Skills						X 1										X* 2,3	
HP48 46 Engineering Mathematics 1					X 1					X 2							X 3
HP46 47 DC and AC Principles																X* 1,2	
HP47 47 Analogue Electronic Principles													X* 2,3,4				X 1
HP3K 47 Electronic Construction Skills			X 1					X 2				X 3				X 4	
HP3G 47 Combinational Logic											X* 1,2,3						X 4
HP6L 47 IT: Applications Software 1															X* 1,2		

Submission date is shown by an X, X* indicates integrated assessment and Outcomes integrated.

Appendix 2a: Year 1, Semester 2 — Assessment Plan (Option A)

Unit Name\Week	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
HP3Y 47 Sequential Logic											X* 1,2,3					X 4	
HP3J 47 Electrical Networks and Resonance																	X* 1,2
HP3M 47 Electronic Testing Skills					X 1				X 2					X 3			X 4
HP3E 47 Applications of PLCs.						X* 1,2										X 3	
HP3V 47 PCB Design, Manufacture and Test																X* 1,2,3,4	
HP41 47 High Level Engineering Software																	X* 1,2,3,4
HP44 47 Electronics Graded Unit 1																	X*

Submission date is shown by an X.

Appendix 2b: Year 2, Semester 1 — Assessment Plan (Option A)

Unit Name\Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
HP3D 48 Active Electronic Circuits																	X* 1,2,3,4
HP3H 48 Business Awareness and CPD																X* 1,2	
HP42 47 MCU/MPU Assembly Language Programming							X* 1,2									X* 1,2	
HP3T 48 Power Supply Circuits										X* 1,2,3							X 4
HP49 47 Engineering Mathematics 2						X 1									X 2		
HP3R 48 MSI Devices													X* 1,2,3			X 4	
HP3W 48 Programmable Logic Devices									X* 1,2								X 3

Submission date is shown by an X.

Appendix 2b: Year 2, Semester 2 — Assessment Plan (Option A)

Unit Name\Week	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
HP3L 48 Electronic Fault Finding				X 1					X 2							X 3	
HP3N 48 Field Programmable Gate Arrays												X* 1,2			X 3		
HP43 48 High Level Language: External I/O Transfer																	X* 1,2,3
HP3F 48 Applications of Signal Processing and Conditioning					X 1					X 2						X 3	
HP40 48 Telecommunications Fundamentals				X 1				X 2					X 3				X 4
HP3P 47 Implementing Small Local Area Networks										X* 1,2						X 3	
HP45 48 Electronics Graded Unit 2																	X*

Submission date is shown by an X.