



Higher National Unit specification

General information for centres

Unit title: Automotive Engineering: Engine Management

Unit code: F53Y 34

Unit purpose: This Unit will provide candidates with technical knowledge of engine management systems. Candidates will learn how to diagnose engine management system faults on vehicles.

On completion of the Unit the candidate should be able to:

- 1 Explain the operation of an engine management system.
- 2 Apply a diagnostic test procedure to an engine management system.
- 3 Analyse information gathered from diagnostic test procedures.

Credit points and level: 2 HN credits at SCQF level 7: (16 SCQF credit points at SCQF level 7*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Recommended prior knowledge and skills: While entry to this Unit will be at the discretion of the centre, it is recommended that candidates have prior knowledge of vehicle electrical systems, for example at SVQ level 3 or equivalent. It would also be beneficial if candidates had prior knowledge and experience of basic electrical and electronic systems as could be evidenced by possession of the HN Unit *Automotive Engineering: Electrical and Electronic Principles and Ancillary Systems*, or equivalent.

Core Skills: There are opportunities to develop the Core Skills of *Communication* and *Problem Solving* at SCQF level 5 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: This Unit could be assessed by a mixture of extended responses and practical exercises, with the use of observation checklists. Candidates could produce a report or extended response of approximately 1,000 words or equivalent to cover all three Outcomes.

Higher National Unit specification: statement of standards

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The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Explain the operation of an engine management system

Knowledge and/or Skills

- ◆ Engine management system layout
- ◆ Engine management component construction, operation and location
 - Electronic Control Unit
 - Sensors
 - Actuators
- ◆ Engine management system principles of operation

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ explain the layout of an engine management system, and annotate a schematic/graphical diagram to show this.
- ◆ explain the component construction, operation and location of the components. This must include Electronic Control Unit (inputs and outputs), sensors and actuators, for at least one vehicle application.
- ◆ explain the principles of operation of an engine management system. This must include the interaction of components within the system.

Assessment Guidelines

Candidates could produce a report or extended response of approximately 1,000 words or equivalent to cover all three Outcomes.

Higher National Unit specification: statement of standards (cont)

Unit title: Automotive Engineering: Engine Management

Outcome 2

Apply a diagnostic test procedure to an engine management system

Knowledge and/or Skills

- ◆ Technical data
- ◆ Specialised diagnostic test equipment
- ◆ Engine management system diagnosis
- ◆ Health and safety procedures

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ select appropriate technical data to carry out a diagnostic test procedure.
- ◆ use technical data for the diagnosis of an engine management system.
- ◆ correctly use specialised diagnostic test equipment. Candidates must test and diagnose an engine management system to identify serviceability.
- ◆ apply appropriate health and safety procedures.

Candidates will complete a practical exercise set under workshop conditions. The system must have a minimum of two faults, one in an actuator and one in a sensor. This Outcome is integrated with Outcome 3.

Assessment Guidelines

Checklists could be used to assist in recording evidence, alongside printouts of the test results. It is recommended this Outcome is assessed using the engine management system from Outcome 1. Candidates could produce a report or extended response of approximately 1,000 words or equivalent to cover all three Outcomes.

Higher National Unit specification: statement of standards (cont)

Unit title: Automotive Engineering: Engine Management

Outcome 3

Analyse information gathered from diagnostic test procedures

Knowledge and/or Skills

- ◆ Systems analysis
- ◆ Systems resolution

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ analyse information gathered from diagnostic test procedures to show the system's condition

Candidates must compare actual recorded data with manufacturer's technical data, making recommendations as to the system's condition and proposed resolution. This Outcome is integrated with Outcome 2.

Assessment Guidelines

This Outcome could be assessed by production of a report, incorporating the information recorded in Outcomes 1 and 2. Candidates could produce a report or extended response of approximately 1,000 words or equivalent to cover all three Outcomes.

Administrative Information

Unit code: F53Y 34

Unit title: Automotive Engineering: Engine Management

Superclass category: XR

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History of changes:

Version	Description of change	Date

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Higher National Unit specification: support notes

Unit title: Automotive Engineering: Engine Management

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 80 hours.

Guidance on the content and context for this Unit

Candidates should achieve the level of understanding of someone who may become a diagnostic technician in the automotive industry, being required to diagnose engine management system faults on vehicles. Faults could be either electrical or electronic. This kind of fault diagnosis is a transferable skill, which may apply to other systems diagnosis.

Where candidates are asked to apply appropriate health and safety procedures, these will relate to the practical element of the particular Outcome.

In Outcome 1, candidates' explanations of the operation of the ECU within the particular system should give a broad overview of the ECU's general operation within the system, without going into major depth of the ECU's internal components. More complex explanation of the general operation of the ECU components could be covered at SCQF level 8.

Where candidates are asked to use technical data to explain an engine management system they should be sourced, for example, from manufacturer's information, manuals, etc. There is no requirement to draw a detailed diagram from scratch.

Outcome 2 should be delivered in an automotive workshop that has sufficient vehicles or systems that enable candidates to carry out the required practical diagnostic tests. It is very important that the relevant data/procedures are available to enable candidates to acquire the salient test procedures.

In Outcome 2, where demonstrating the correct use of technical data for systems diagnosis, this may take the form of, for example, a flow chart, software program, or procedures list.

Outcome 2 of this Unit could be integrated with other practical Units in the *Automotive Engineering* HNC framework eg *Automotive Engineering: Diagnostics*.

Guidance on the delivery and assessment of this Unit

If this Unit is undertaken as part of the Automotive Engineering HNC, it is strongly recommended that it is integrated in its delivery and assessment with other pertinent Units from this Group Award.

In Outcome 1 it is recommended that both spark ignition and compression ignition engine management systems are covered.

In Outcome 2 the specialised diagnostic test equipment covered could include: multi-meter; exhaust gas analyser; cathode ray oscilloscope; serial code reader (SCR)/onboard diagnostics (OBD).

Outcomes 2 and 3 must be integrated. While Outcome 3 could be assessed either by a report or by a checklist, the correct serviceability must always be ascertained by candidates, with their recommendations.

Higher National Unit specification: support notes (cont)

Unit title: Automotive Engineering: Engine Management

Opportunities for developing Core Skills

The delivery and assessment of this Unit may contribute towards the Core Skill of *Communication* at SCQF level 5.

The general skills of the Written Communication component are ‘read, understand and evaluate written communication’ for its reading element and ‘produce well-structured written communication’ for its written element. Specific reading skills required by candidates at SCQF level 5 include identifying and summarising significant information, ideas and supporting details in a written communication, and evaluation of the effectiveness of the communication in meeting its purpose; and specific writing skills include ‘presenting all essential ideas, information and supporting detail in a logical and effective order, and use of a structure which takes account of purpose and audience, emphasising the main points.

Candidates may need to utilise these skills in such tasks as explaining the construction and operation of the components of an engine management system in Outcome 1 and the analysis of information gathered from test procedures in Outcome 3. Candidates may be asked to produce an extended response on these and related topics, of around 1,000 words or equivalent covering Outcomes 1 and 3, which would allow for development of Communication.

Depending on assessment instruments used, candidates may develop the Oral Communication component to SCQF level 5, if for example, delivering an oral presentation or leading discussion on any of these topics.

The delivery and assessment of this Unit may offer opportunities to develop the Core Skill of *Problem Solving* at SCQF level 5. Its three components Critical Thinking, Planning and Organising and Reviewing and Evaluating require candidates to be able to:

- ◆ analyse a situation or issue
- ◆ plan, organise and complete a task
- ◆ review and evaluate a problem solving activity

These skills may be used during this Unit, especially given the practical nature of Outcome 2 which may require the planning of the test procedure. Candidates will need to use specialised equipment to gather information, which they will later analyse to arrive at a conclusion (diagnosis). Candidates could be asked to plan their activity and to review the success of their problem solving strategy upon completion of the task, in conjunction with their analysis of the information gathered in Outcome 3.

Open learning

This Unit could be delivered by distance learning. However, it would require planning by the centre to ensure the sufficiency and authenticity of candidate evidence. Completion of this Unit would also require access to specialised equipment. The practical aspects and equipment required (it must be delivered under workshop conditions) may engender some difficulties in delivering via open learning.

Higher National Unit specification: support notes (cont)

Unit title: Automotive Engineering: Engine Management

Candidates with disabilities and/or additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* (www.sqa.org.uk).

General information for candidates

Unit title: Automotive Engineering: Engine Management

This Unit will provide you with the technical knowledge to appreciate the developments and requirements of engine management systems for specific and general applications, whilst meeting operational needs.

On completion of the Unit you should be able to:

- 1 Explain the operation of an engine management system.
- 2 Apply a diagnostic test procedure to an engine management system.
- 3 Analyse information gathered from diagnostic test procedures.

The knowledge and skills in this Unit will allow you to diagnose a given engine management system and make recommendations to rectify any faults found.

Throughout the Unit, you will need to follow appropriate health and safety procedures in any practical work undertaken.

In Outcome 2, you will be assessed by completion of practical exercises, under the observation of your tutor.

In undertaking this Unit there may be opportunities for you to develop Core Skills in the areas of *Communication* and *Problem Solving* at SCQF level 5.