



Higher National Graded Unit specification

General information for centres

This Graded Unit has been validated as part of the HNC in Automotive Engineering. Centres are required to develop the assessment instrument in accordance with this validated specification. Centres wishing to use another type of Graded Unit or assessment instrument are required to submit proposals detailing the justification for change for validation.

Graded Unit title: Automotive Engineering: Graded Unit 1

Graded Unit code: F5DN 34

Type of Graded Unit: Project

Assessment Instrument: Practical Assignment

Credit points and level: 1 HN credit at SCQF level 7: (8 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.*

Purpose: This Graded Unit is designed to provide evidence that the candidate has achieved the following principal aims of the HNC in Automotive Engineering:

- ◆ to develop candidates' knowledge and skills in planning, developing and evaluating
- ◆ to develop study and research skills
- ◆ to develop awareness of responsible environmental management
- ◆ to support candidates' Continuing Professional Development and career development
- ◆ to develop knowledge, understanding and skills in automotive engineering principles and technologies
- ◆ to give candidates an in-depth knowledge of the vehicular systems, components and integration of the associated systems pertaining to their respective sector
- ◆ to develop candidates' abilities to analyse automotive engineering problems
- ◆ to develop candidates' abilities to apply a logical and systematic approach to diagnosis of components and inter-disciplinary vehicular systems
- ◆ to prepare candidates for employment in the automotive industry

Recommended prior knowledge and skills: 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 Graded Unit:

- ◆ *Automotive Engineering: Electrical and Electronic Principles and Ancillary Systems*
- ◆ *Automotive Engineering: Engine Management Systems*
- ◆ *Automotive Engineering: Diagnostics*

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- ◆ *Automotive Engineering: Engine Technology*
- ◆ *Automotive Engineering: Steering and Suspension Systems*
- ◆ *Automotive Engineering: Braking Systems and Vehicle Stability Control*

Core Skills: Achievement of this Unit gives automatic certification of the following:

- ◆ Problem Solving at SCQF level 5

Assessment: This Graded Unit will be assessed by the use of a practical assignment. The developed Practical Assignment should provide the candidate with the opportunity to produce evidence that demonstrates she/he has met the aims of the Graded Unit that it covers. Since the Core Skill of *Problem Solving* at SCQF level 5 is embedded in this Unit, it is strongly recommended that you follow the assessment guidelines given. If you wish to use a different assessment model, you should seek prior moderation of the assessment instrument(s) you intend to use to ensure that the Core Skill is still covered.

Administrative Information

Graded Unit code: F5DN 34
Graded Unit title: Automotive Engineering: Graded Unit 1
Original date of publication: March 2009
Version: 01

History of changes:

Version	Description of change	Date

Source: SQA

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Higher National Graded Unit specification: instructions for designing the assessment task and assessing candidates

Graded Unit title: Automotive Engineering: Graded Unit 1

Conditions of assessment

The candidate should be given a date for completion of the Practical Assignment. However, the instructions for the assessment task should be distributed to allow the candidate sufficient time to assimilate the details and carry out the assessment task. During the time between the distribution of the assessment task instructions and the completion date, assessors may answer questions, provide clarification, guidance and reasonable assistance. The assessment task should be marked as soon as possible after the completion date. The final grading given should reflect the quality of the candidate's evidence at the time of the completion date.

The evidence for the project is generated over time and involves three distinct stages, where each stage has to be achieved before the next is undertaken. Thus any re-assessment of stages must be undertaken before proceeding to the next stage.

If a candidate fails the project overall or wishes to upgrade, then this must be done using a *substantially different* project, ie all stages are undertaken using a new project, assignment, case study, etc. In this case, a candidate's grade will be based on the achievement in the re-assessment, if this results in a higher grade.

Instructions for designing the assessment task

The assessment task is a project. The project undertaken by the candidate must be a complex task which involves:

- ◆ variables which are complex or unfamiliar
- ◆ relationships which need to be clarified
- ◆ a context which may be familiar or unfamiliar to the candidate

Candidates will be given a scenario in which a customer's vehicle exhibits certain symptoms pertaining to each fault inserted into the vehicle systems. The candidate must be instructed to carry out a routine service/diagnostic check on all the vehicle systems to ensure that no faults are stored in the various Electronic Control Unit (ECU) memories. The assessment task must require candidates to carry out a series of electrical and electronic diagnostic tests within all the relevant automotive systems (Engine Management, Fuel and Ignition, Steering and Suspension, Anti-lock Braking System (ABS) Braking and Vehicle Stability, and Ancillary systems to diagnose the faults inserted into the vehicle. The candidate will be required to identify and rectify a **minimum** of two faults within above systems. Each fault must be in a separate system and must be able to be identified by the use of electrical/electronic diagnostic equipment.

The task must require candidates to:

- ◆ analyse the task and decide on a course of action for undertaking the project
- ◆ plan and organise work, and carry it through to completion
- ◆ identify manufacturers' test data standards
- ◆ collect vehicle system data
- ◆ analyse and interpret data collected, against manufacturer's specifications of systems
- ◆ identify sources of error, eg age of component, age of vehicle etc
- ◆ diagnose faults within vehicle systems
- ◆ rectify faults within vehicle systems

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- ◆ retest systems to confirm that faults have been rectified **and** no others introduced into the system
- ◆ summarise findings for a customer
- ◆ reflect on work done and draw conclusions for the future
- ◆ produce evidence of meeting the aims which this Graded Unit has been designed to cover

Guidance on grading candidates

Candidates who meet the minimum Evidence Requirements will have their achievement graded as C — competent, or A — highly competent or B somewhere between A and C. The grade related criteria to be used to judge candidate performance for this Graded Unit is specified in the following table.

Grade A	Grade C
<p>Is a seamless, coherent piece of work which:</p> <ul style="list-style-type: none"> ◆ has sufficient evidence of the three essential stages of the project (planning, developing and evaluating) which is produced to a high standard ◆ demonstrates an accurate and insightful interpretation of the scenario ◆ is highly focussed and relevant to tasks associated with the scenario ◆ provides an action plan containing a comprehensive list of project activities and timings ◆ meets the project timelines specified in the action plan ◆ is comprehensive and well structured throughout with language of a high standard in terms of level, accuracy and technical content ◆ effectively consolidates and integrates required knowledge and skills with continuity and consistency throughout ◆ requires a minimum of supervision ◆ demonstrates a high level of self motivation throughout ◆ consistently applies health and safety procedures relevant to the tasks undertaken 	<p>Is a co-ordinated piece of work which:</p> <ul style="list-style-type: none"> ◆ has sufficient evidence of the three essential stages of the project (planning, developing and evaluating), which is produced to an adequate standard ◆ demonstrates an acceptable interpretation of the scenario ◆ is focussed and relevant to tasks associated with the scenario ◆ provides an action plan containing the essential project activities and timings ◆ meets the project timelines specified in the action plan ◆ is structured with appropriate language in terms of level, accuracy and technical content ◆ consolidates and integrates knowledge and skills ◆ requires intervention from the tutor to ensure the project remains on schedule ◆ demonstrates an acceptable level of motivation ◆ consistently applies health and safety procedures relevant to the tasks undertaken

The project will be marked out of 100. Assessors will mark each stage of the project, taking into account the criteria outlined. The marks will then be aggregated to arrive at an overall mark for the project. Assessors will then assign an overall grade to the candidate for this Graded Unit based on the following grade boundaries.

- A = 70% — 100%
- B = 60% — 69%
- C = 50% — 59%

Note: the candidate must achieve all of the minimum evidence specified below for each stage of the project in order to achieve the Graded Unit.

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Evidence Requirements

The project consists of three stages: planning; developing; and evaluating. The following table specifies the minimum evidence required to pass each stage.

Note: The candidate must achieve **all of the minimum evidence** specified below for each stage of the project in order to pass the Graded Unit.

Project stage	Minimum Evidence Requirements
Stage 1 — Planning 30%	<p>An action plan, containing:</p> <ul style="list-style-type: none"> ◆ analysis of the scenario and the identification of the key factors influencing the project and their interrelationships; in response to the vehicle’s symptoms ◆ details of the tasks to be undertaken by the candidate, including timelines which reflect industry standards (manufacturer’s diagnosis and repair timescales) ◆ identification of manufacturer’s specifications, for systems ◆ a set of project objectives that accurately and fully reflect the long term aims of the project ◆ identification of materials and resources required and how they will be accessed ◆ identification of appropriate Health and Safety procedures ◆ identification of the stages involved and the timescales for completion of each stage of the Graded Unit <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Planning stage.</i></p>
Stage 2 — Developing 35%	<p>Evidence for the developing stage in the form of a test plan that includes:</p> <ul style="list-style-type: none"> ◆ details of equipment to be used ◆ details of diagnostic procedures to be carried out ◆ health and safety procedures to be applied <p>Candidates must follow the test plan to record results, and:</p> <ul style="list-style-type: none"> ◆ collect vehicle system data ◆ analyse and interpret data collected, against manufacturer’s specifications of systems ◆ identify sources of error, eg age of component, age of vehicle etc ◆ diagnose faults within vehicle systems ◆ rectify faults within vehicle systems ◆ retest systems to confirm that faults have been rectified and no others introduced into the system <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Developing stage.</i></p>

Higher National Graded Unit specification: instructions for designing the assessment task and assessing candidates (cont)

Project stage	Minimum Evidence Requirements
Stage 3 — Evaluating 35%	<p>An evaluation report which includes summary of findings for the customer, and self-evaluation. Candidates will be required to rectify a minimum of two faults in the systems, and provide evidence of this in their summary of findings.</p> <p>The summary of the candidate’s findings, will include:</p> <ul style="list-style-type: none"> ◆ evidence of checking all vehicle systems ◆ details of the faults found ◆ an interpretation of manufacturer specifications and data collected to support their findings ◆ evidence of rectification a minimum of two faults within vehicle systems ◆ summary of findings for a customer ◆ conclusion and discussion ◆ references ◆ reflect on work done and draw conclusions for the future <p>The candidate’s self evaluation will:</p> <ul style="list-style-type: none"> ◆ contain an outline of the scenario ◆ summarise any unforeseen events and how they were handled ◆ identify knowledge and skills which have been developed. ◆ assess the strengths and weaknesses of the practical assignment ◆ determine to what extent the assignment met the scenario’s requirements <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Evaluating stage.</i></p>

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Support notes

Candidates will be given a scenario in which a customer's vehicle exhibits certain symptoms. To cover all vehicle systems, the scenario may include, for example, that the vehicle has been booked into the workshop for a major service which includes a standard full vehicle systems check for fault codes. The customer may also have described certain symptoms that require investigation eg difficult to start, heavy fuel consumption, warning light on dash illuminated, etc. The assessment task must require the candidate to carry out a series of diagnostic tests within all the relevant automotive systems to check all the vehicle systems for correct operation and to diagnose the faults (a minimum of two) applied within in the vehicle systems. The faults introduced into the vehicle systems must be detectable by electrical/electronic diagnostic equipment. These could include any of regular day-to-day faults relating to emissions, engine misfires, loss of power, defective door locks, defective windows, steering, braking, reflecting and integrating the knowledge and skills covered across the HNC's mandatory section. This list of suggestions is not exhaustive, nor prescriptive.

The Core Skill of *Problem Solving* at SCQF level 5 is embedded in this Unit. The three components of Critical Thinking, Planning and Organising and Reviewing and Evaluating require candidates to be able to:

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

These skills will be used across all three Outcomes within the Unit, in which candidates need to use equipment to gain information and arrive at a conclusion (in this case, a diagnosis). Candidates must plan their activity and review the success of their problem solving strategy upon completion of the task.

The project brief will sample elements from the mandatory Units. Some examples are listed below:

Unit title	Skills/elements
Automotive Engineering: Diagnostics	practical skills, diagnostic skills, meeting timescales, applying health and safety, Problem Solving,
Automotive Engineering: Electrical and Electronic Principles and Ancillary Systems	practical skills, applying electrical/electronic principles, Communication, Problem Solving
Automotive Engineering: Engine Management Systems	practical skills, diagnostic skills, meeting timescales, applying health and safety, planning skills, Problem Solving
Automotive Engineering: Engine Technology	underpinning knowledge of vehicle engines, applying combustion principles, meeting timescales, Communication

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Unit title	Skills/elements
Automotive Engineering: Steering and Suspension Systems	practical skills, diagnostic skills, meeting timescales, applying health and safety, Problem Solving, Communication
Automotive Engineering: Braking Systems and Vehicle Stability Control	practical skills, diagnostic skills, meeting timescales, applying health and safety, Communication,

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 assessment arrangements. For information on these, please refer to the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on SQA's website: www.sqa.org.uk.

General information for candidates

This Graded Unit will give you the opportunity to integrate the knowledge and skills which you have gained in your study of the HNC in Automotive Engineering.

It will enable and aid you to:

- ◆ develop knowledge and skills in planning, developing and evaluating
- ◆ develop study and research skills
- ◆ develop awareness of responsible environmental management
- ◆ develop knowledge, understanding and skills in automotive engineering principles and technologies
- ◆ gain an in-depth knowledge of the vehicular systems, components and integration of the associated systems pertaining to their respective sector
- ◆ develop abilities in analysing automotive engineering problems
- ◆ develop abilities in applying a logical and systematic approach to diagnosis of components and inter-disciplinary vehicular systems
- ◆ prepare for employment in the automotive industry

The assessment will take the form of a practical assignment in which you will need to plan, develop and evaluate. You will be given a scenario in which a customer's vehicle exhibits certain symptoms. Using your knowledge and skills developed in previous Units undertaken, you will then be required to carry out a series of diagnostic tests within all the relevant automotive systems. You will diagnose the faults in the vehicle, rectify the faults and ensure no others have been introduced during the process.

Before carrying out the practical tasks you will need to analyse the information given from symptoms in the scenario to decide how best to select and use the diagnostic equipment to locate and rectify faults.

The task will require you to:

- ◆ analyse the task and decide on a course of action for undertaking the project
- ◆ plan and organise work, and carry it through to completion
- ◆ diagnose faults
- ◆ rectify faults
- ◆ retest systems to ensure that faults have been rectified and no others introduced into the system
- ◆ summarise findings for the customer
- ◆ reflect on work done and draw conclusions for the future
- ◆ produce evidence of meeting the aims of this Graded Unit

During the testing of all the vehicle systems, you will be required to record your findings against manufacturer's specification and decide if the vehicle system is serviceable or not. Where a system is found to have a fault you must locate the faulty component and repair or replace it to ensure that the system is left in a serviceable condition. Where the system is found to have no faults, you must still provide evidence that system is within the manufacturer's specifications.

After rectifying any faults found in the vehicle systems you must then reflect on how you went about the task. You should consider whether you could have gone about the task in a different manner or used alternative equipment to make the repair more efficient.

The activities in this Unit will allow you to achieve the Core Skill of *Problem Solving*, in that you will need to think critically with regard to diagnosis of the vehicle, plan and organise your work, and finally to review and evaluate the process.