



## Higher National Graded Unit specification

### General information for centres

This Graded Unit has been validated as part of the HNC and HND Petroleum 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:** Petroleum Engineering: Graded Unit 1

**Graded Unit code:** F546 34

**Type of Graded Unit:** Project

**Assessment Instrument:** Case Study

**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 Petroleum Engineering:

General aims:

- ◆ to develop skills of study, research and analysis
- ◆ to develop ability to define and solve problems
- ◆ to develop transferable skills
- ◆ to develop ability to be flexible and work cooperatively with others
- ◆ to develop responsibility for learning
- ◆ to develop planning, organisational and review/evaluation skills
- ◆ to develop technical skills — broadening and deepening
- ◆ to develop spoken, written and pictorial communication skills
- ◆ to develop numerical and ICT skills
- ◆ to develop resource management skills
- ◆ to develop knowledge, skills and motivation as a basis for progression to higher level studies

Specific aims:

- ◆ prepare candidates for employment in the petroleum engineering industry

## General information for centres (cont)

- ◆ provide candidates with a range of contemporary vocational skills embracing the prime discipline of petroleum engineering such as geosciences, oilfield drilling, reservoir engineering, oil well engineering and petroleum production processes
- ◆ provide a choice of optional units that will allow candidates to develop in other areas relevant to employment, and career enhancement or progression via an HND within the petroleum engineering industry
- ◆ enable candidates to achieve appropriate professional body recognition as an engineering technician

**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:

- ◆ DP9M 34 *Science Industry: Key Issues*
- ◆ F52Y 34 *Petroleum Engineering: Physics, Mathematics and Chemistry*
- ◆ F530 34 *Petroleum Geology and Geophysics: An Introduction*
- ◆ F533 34 *Petroleum Reservoir Engineering: An Introduction*
- ◆ F52X 34 *Oilfield Drilling Techniques and Operations: An Introduction*

**Core Skills:** The achievement of this Unit gives automatic certification of the following:

- ◆ Critical Thinking at SCQF level 5
- ◆ Planning and Organising at SCQF level 5

There are also opportunities to develop aspects of the Core Skills in *Communication* and *Numeracy* at SCQF level 6 in this Unit and these are highlighted in the Support notes of this Unit specification.

**Assessment:** This Graded Unit will be assessed by the use of a case study. The developed case study 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.

## Administrative Information

**Graded Unit code:** F546 34  
**Graded Unit title:** Petroleum Engineering: Graded Unit 1  
**Original date of publication:** August 2008  
**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:** Petroleum Engineering: Graded Unit 1

### **Conditions of assessment**

The candidate should be given a date for completion of the case study. 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

The assessment task must require the candidate 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
- ◆ reflect on what has been done and draw conclusions for the future
- ◆ produce evidence of meeting the aims which this Graded Unit has been designed to cover

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

The assessment task should be a case study based project within the context of a petroleum engineering discipline, or a combination of up to four such disciplines embraced by the core Units of the HNC framework. The range of tasks within the case study to be undertaken should be defined in relation to the context of a particular petroleum engineering development, and to what it is reasonable to expect of candidates in the time scales available. The case study issues selected should focus on the main aims of the HNC Petroleum Engineering course, particularly in the discipline fields of geosciences, oil-well drilling, reservoir engineering, production techniques and processes, and the need to demonstrate an ability to integrate knowledge and skills across the mandatory units within the award framework.

The case study should allow the candidate to demonstrate valid responses to the current and future issues and development needs of the petroleum engineering industry including, where appropriate, Health, Safety and Environmental issues. Where relevant, the assessment task should consider safe working practices in accordance with current regulations and codes of practice. Environmental considerations should include reference to criteria affecting, and the impact of not implementing, a sustainability approach.

### 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"> <li>◆ provides considerably more than the minimum Evidence Requirements for each of the three stages</li> <li>◆ evidence is of a high standard</li> <li>◆ includes a particular insightful interpretation of the case study brief</li> <li>◆ has continuously accessed available guidance in arriving at the Outcomes submitted</li> <li>◆ embodies non-traditional and innovative methodology and solutions</li> <li>◆ has accessed a wide range of relevant resources, information, documentation and data</li> <li>◆ Outcomes are of a high standard in terms of scope, accuracy and technical content</li> <li>◆ consolidates and integrates required knowledge and skills showing continuity and consistency</li> <li>◆ considers possible conflict in integrating solutions in relation to constraints imposed</li> </ul>	<p>Is a co-ordinated piece of work which:</p> <ul style="list-style-type: none"> <li>◆ provides the minimum Evidence Requirements for each of the three stages</li> <li>◆ evidence is produced to an acceptable standard</li> <li>◆ includes an interpretation of the case study brief</li> <li>◆ has made satisfactorily use of available guidance in arriving at the Outcomes submitted</li> <li>◆ embodies only routine and traditional methodology and solutions</li> <li>◆ has accessed a satisfactory range of resources, information, documentation and data</li> <li>◆ Outcomes are of a satisfactory standard in terms of scope, level and technical content</li> <li>◆ consolidates and integrates knowledge and skills but lacks some continuity and consistency</li> <li>◆ considers proposed solution in isolation from constraints imposed</li> </ul>

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

Grade A	Grade C
<ul style="list-style-type: none"> <li>◆ includes clear rationale and justification for solutions proposed</li> <li>◆ clearly and comprehensively addresses a fit-for-purpose objective in arriving at proposed solution</li> <li>◆ clearly identifies key areas for improvement when undertaking the work to the defined time line action plan</li> <li>◆ clearly identifies key areas for improvement when reflecting on the technical solutions chosen compared with the initial objectives</li> </ul>	<ul style="list-style-type: none"> <li>◆ includes a satisfactory rationale with just sufficient justification</li> <li>◆ satisfactorily addresses a fit-for-purpose objective in arriving at proposed solution</li> <li>◆ achieves Outcomes with minimum evaluation against the time line plan</li> <li>◆ assumes the technical solutions chosen as ‘most appropriate’ with minimal retrospective comparison with initial objectives</li> </ul>

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.

### Evidence Requirements

The Case Study 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 (20%)	<p><b>Develop an action plan for Stage 2 and 3</b> that includes:</p> <ul style="list-style-type: none"> <li>◆ interpretation of case study brief into a suitable time line plan</li> <li>◆ identification of resources required and their likely sources</li> </ul> <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Planning stage.</i></p>

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

Project stage	Minimum Evidence Requirements
Stage 2 — Developing (60%)	<p><b>Use appropriate methods in undertaking the specific tasks in Stage 2</b> which should include:</p> <ul style="list-style-type: none"> <li>◆ use appropriate methods in undertaking specific tasks               <ul style="list-style-type: none"> <li>— select criteria and reasoning/justification</li> <li>— conduct a preliminary evaluation of agreed elements of this stage</li> <li>— establish and use required resources such as hardware and software</li> <li>— establish and use required guidance, information, documentation and data</li> </ul> </li> <li>◆ produce evidence in a suitable form to support the development of the case study solution               <ul style="list-style-type: none"> <li>— adequate reports, specifications, drawings/diagrams, schedules, calculations and test results to justify understanding and completion of required tasks</li> <li>— rationale and justification for proposal submitted</li> </ul> </li> <li>◆ create a case study portfolio               <ul style="list-style-type: none"> <li>— portfolio including executive summary and evidence of development and conclusions</li> <li>— presentation as an introduction to viva voce interview to include objectives and progress against chosen solutions</li> </ul> </li> <li>◆ issues of compliance with Health, Safety and Environmental requirements</li> </ul> <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Developing stage.</i></p>
Stage 3 — Evaluating (20%)	<p><b>Reflective report on Outcomes from Stage 1 and 2</b>, which should include:</p> <ul style="list-style-type: none"> <li>◆ critical evaluation of Outcomes achieved compared with the time line action plan</li> <li>◆ critical comparison of submitted evidence against initial objectives</li> <li>◆ identification of feedback to inform future similar tasks</li> <li>◆ issues of compliance with Health, Safety and Environmental requirements</li> </ul> <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Evaluating stage.</i></p>

### Marking Tariff

Assessors should adhere to the following appropriate marks distribution between the 3 stages of the Case Study:

Project Stage	Appropriate Percentage of Marks
Planning	20
Developing	60
Evaluating	20

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

### Support notes

Project-based Case Study should present a candidate with an unfamiliar and complex problem for solution. They may be college-derived in conjunction with industrial requirements or workplace related for candidates employed within the petroleum engineering industry.

Candidates will be supplied with a clear brief of the aim of the assessment task for their case study which must supply sufficient information to allow candidates to:

- ◆ interpret the needs of the case study brief
- ◆ identify information sources to clarify the brief
- ◆ formulate a realistic solution approach
- ◆ implement the chosen solution approach within set resources
- ◆ critically evaluate the solution Outcome(s)

The developed Case Study specification should allow candidates to produce evidence that is clearly identifiable as individual work. However, this not does preclude individual projects being part of a larger group project. Candidates' contribution to a larger group project would present opportunities to develop the Core Skill of *Working with Others*.

Projects may consist of one of the following:

- ◆ appraisal of an existing petroleum engineering technology application
- ◆ appraisal of an existing petroleum engineering system
- ◆ feasibility study of a technical issue or proposal
- ◆ laboratory investigation

### OR

A combination of the any of the above to provide a multi-disciplinary project within the field of petroleum engineering.

The project or assignment task should be designed to allow the student to:

- ◆ produce a case study specification from the customer requirements brief
- ◆ define milestone objectives for the case study work
- ◆ draw-up an initial case study activity schedule which should be used to inform on-going development
- ◆ justify chosen case study direction in relation to one or more alternatives
- ◆ feedback to a case study supervisor on a regular basis
- ◆ access appropriate hardware, software, documentation and reference materials to support the project development
- ◆ generate or gather, as appropriate, test results, investigation data or information
- ◆ analyse test results, investigation data or information collated during the case study
- ◆ maintain an activity log book/diary throughout the duration of the case study
- ◆ complete a case study report which conforms to appropriate report standards, includes an evaluation of the case study Outcomes
- ◆ present details of the case study including a reflective account of the project Outcomes
- ◆ comply with all relevant Health, Safety and Environmental requirements



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

### **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](http://www.sqa.org.uk)**.

## General information for candidates

This Graded Unit forms a mandatory Unit for the HNC and HND awards in Petroleum Engineering. It will normally be delivered to you during the second half of your HNC level studies

The Unit requires that you undertake a project-based case study in a complex and unfamiliar topic within the field of Petroleum Engineering.

Engineering technicians and incorporated engineers frequently undertake case studies of an investigative nature where a customer is defined as the end-user of the case study Outcomes. Such case study work starts with understanding the customer brief and translating this into a specification and objectives. This leads into scheduling activities to ensure that all objectives will be met in the allocated timescale of the case study. It then proceeds to implementation of the case study and applying appropriate authentication techniques to ensure that the case study Outcomes are thoroughly tested as being fit-for-purpose. The final phase of a case study is a reflective evaluation of the overall approach and Outcomes.

At the start of this Graded Unit, just as in a real-life industrial situation, you will be presented a customer requirement brief from which you will develop the case study specification and a list of tasks to enable completion of the case study objectives. You will make plans to undertake the case study; you will develop the case study tasks; you will evaluate the work you have done during the case study and you will evaluate what you have learned and what you would do differently next time.

During this case study you will develop knowledge and skills directly relevant to petroleum engineering disciplines. You will also develop knowledge and skills in the none-technical aspects associated with case study assignments such as managing aspects of planning and organisation, communication, evaluative skills, time management and many others.

The HNC course units will lay the foundations for this Graded Unit which will prepare you to undertake the tasks necessary to complete your case study. Tutors will provide guidance during the Graded Unit and you will have to submit evidence for each stage of the assignment. This evidence will include the maintenance of a case study activity log book or diary, submission of a comprehensive written report and the delivery of a short presentation.

On successful completion of the Graded Unit you will be graded A, B or C. Further details of this grading will be given to you by the project tutor at the delivery centre.