



Higher National Graded Unit specification

General information for centres

This Graded Unit has been validated as part of the 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 2

Graded Unit code: F547 35

Type of Graded Unit: Project

Assessment Instrument: Practical assignment

Credit points and level: 2 HN credits at SCQF level 8: (16 SCQF credit points at SCQF level 8*)

**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 HND Petroleum Engineering:

- ◆ to further develop transferable skills to levels demanded by employers and for progression to higher education
- ◆ to develop the ability to apply analysis and synthesis skills to the solution of petroleum engineering problems
- ◆ to develop knowledge and skills in planning, scheduling and project management
- ◆ to develop investigative skills
- ◆ to develop a range of communication skills relevant to the needs of an Engineering Technician within the petroleum production industry
- ◆ further develop knowledge, understanding and skills in a range of core petroleum engineering principles
- ◆ allow for further specialisation within the core petroleum engineering discipline areas: Geosciences, Reservoir Engineering, Oil Well Drilling, Well Engineering, Petroleum Recovery Techniques, Petroleum Production Processes and Production Monitoring
- ◆ expand on the range of knowledge and skills in the mandatory core of the HND in Petroleum Engineering
- ◆ to further develop Core Skills in *Communication, Numeracy* and *Problem Solving*
- ◆ to develop knowledge and skills in line with relevant National Occupational Standards

General information for centres (cont)

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:

- ◆ HND Mandatory Core units
- ◆ F52W 35 *Oilfield Drilling Techniques and Operations*
- ◆ F52T 35 *Oil well management*
- ◆ F532 35 *Petroleum Recovery Techniques*
- ◆ F531 35 *Petroleum Production Processes*
- ◆ DV5J 35 *Project Management*

Candidates are also expected to have completed the mandatory units from the HNC framework:

- ◆ 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*

Candidates should also have completed, or be in the process of completing, any optional units from the HND framework that are relevant to their Graded Unit 2 assessment task.

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

- ◆ Critical Thinking at SCQF level 6
- ◆ Planning and Organising at SCQF level 6

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 Practical Assignment. The developed Practical Assessment task 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.

The developed assessment specification should allow candidates to produce evidence that is clearly identifiable as individual work. However, this does not 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*.

Administrative Information

Graded Unit code: F547 35
Graded Unit title: Petroleum Engineering: Graded Unit 2
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 2

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

This Graded Unit is a project-based assessment task whose purpose is to provide candidates with an opportunity to apply and integrate a range of knowledge and skills within the Petroleum Engineering discipline.

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 project 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

The assessment tasks should be posed as being comprised of three distinct stages:

Stage 1: Planning

Stage 2: Implementation

Stage 3: Evaluating

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

The tasks within the project to be undertaken should be defined in relation to the context of a particular realistic petroleum engineering problem or development, and to what it is reasonable to expect of candidates with the resources available. Proposals for project topics are entirely the responsibility of the delivery centre but every opportunity should be taken to involve the petroleum industry in devising projects that are relevant to current issues development needs.

The project assessment task may be a wholly practical assignment, a wholly theoretical investigation, or a combination of these within the context of a petroleum engineering discipline. A project proposal may focus on a single petroleum engineering discipline or may be devised to integrate knowledge and skills across up to three distinct petroleum engineering disciplines embodied within the core units of the HND framework.

The project 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.

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

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"> ◆ is highly focused and relevant to the tasks associated with the project brief ◆ is clear and well structured throughout and language used is of a high standard in terms of level, accuracy and technical content ◆ demonstrates clear and explicit links between the three stages of the project work ◆ effectively applies, consolidates and integrates required knowledge and skills in petroleum engineering to all stages of the project work ◆ demonstrates the candidate's ability to work autonomously with minimum support or revision ◆ demonstrates that the candidate has undertaken additional relevant work within the project that is well beyond that required by the project brief ◆ contains a presentation in which the candidate enthusiastically demonstrates a deep understanding of the project work undertaken ◆ demonstrates a comprehensive and imaginative approach to the project brief so that it provides a challenging context within which the candidate can demonstrate a high level of skills in petroleum engineering 	<p>Is a co-ordinated piece of work which:</p> <ul style="list-style-type: none"> ◆ is focused and relevant to the tasks associated with the project brief ◆ is satisfactorily structured and language used is adequate in terms of level, accuracy and technical content ◆ contains sufficient evidence to meet the minimum requirement of each of the three stages of the project work ◆ applies, consolidates and integrates knowledge and skills in petroleum engineering to the project work but this may lack some continuity and consistency ◆ has required additional support and revision during project ◆ demonstrates that the candidate has undertaken an acceptable amount of relevant work within the project that satisfies the project brief ◆ contains a presentation in which the candidate demonstrates an understanding of the project work undertaken ◆ approaches the project brief in a manner which successfully allows the candidate to use a satisfactory level of skills in petroleum engineering

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.

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

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 that includes:</p> <ul style="list-style-type: none"> ◆ a project brief identifying customer requirements and project aim ◆ a project specification that the customer has agreed ◆ a set of project objectives ◆ a project schedule identifying the project stages involved and the timescales for completion of each stage ◆ identification of information sources to be used ◆ identification of materials and resources required and how they will be accessed ◆ information about possible different solution options ◆ justification of the solution approach to be adopted ◆ project Outcomes verification strategy ◆ maintenance of a project activity log-book ◆ compliance with relevant Health, Safety and Environmental requirements <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 (50%)	<ul style="list-style-type: none"> ◆ output of the project activity that supports the project objectives and meets the quality necessary to satisfy the customer requirements: <ul style="list-style-type: none"> — tangible outputs from the project activity, whether these are of an engineering design, analysis, development or investigative nature — a record of the processes underpinning the project activity <ul style="list-style-type: none"> – log book – progress reports – test results or investigative findings as part of the verification strategy — complies with Health, Safety and Environmental requirements <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 (20%)	<p>Evaluation Report, which should:</p> <ul style="list-style-type: none"> ◆ review of project specification as the project progresses ◆ review of project schedule/action plan as the project progresses ◆ analysis used to decide on project solution option ◆ progress reporting and goal setting as part of project implementation ◆ summary of any unforeseen circumstances and how they were handled ◆ interpretation of test results or investigative findings ◆ actions taken as a result of test results or investigative findings ◆ reflective part of the oral presentation ◆ indication of any knowledge and skills which have been gained and/or developed ◆ assessment of the strengths and weaknesses of the output of the project assignment ◆ an evaluation of the extent to which the assignment Outcomes met the original brief ◆ issues of compliance with Health, Safety and Environmental requirements <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 project:

Project Stage	Appropriate Percentage of Marks
Planning	30
Developing	50
Evaluating	20

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

Support notes

Projects 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.

Projects should be allocated on an individual candidate basis but each project could form a clearly individual contribution to a wider group activity in the area of petroleum engineering.

Projects may consist of one of the following:

- ◆ an petroleum engineering system or process design; or component thereof
- ◆ modification design of an existing engineering system
- ◆ Petroleum Engineering system or process prototype development
- ◆ Performance Analysis/Simulation study of petroleum engineering problem
- ◆ feasibility study of a petroleum engineering 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.

Examples of such projects could include:

- ◆ simulation of the flow characteristics in a hydrocarbon reservoir
- ◆ development of down-hole data acquisition and analysis systems for well performance assessment
- ◆ well performance optimisation assessment
- ◆ investigation into deep-water drilling technologies
- ◆ design modification of the well-head fluid handling equipment

The assessment task requires the candidate to:

- ◆ produce a project brief and specification from the customer requirements
- ◆ produce a project aim and define milestone objectives
- ◆ draw-up an initial project activity schedule which should be used to inform on-going project planning and development
- ◆ justify chosen project solution in relation to one or more alternative solutions
- ◆ develop a verification strategy for the project
- ◆ feedback to a project supervisor on a regular basis
- ◆ access appropriate hardware, software, documentation and reference materials to support the project development
- ◆ implement project solutions
- ◆ test product or check investigation data to confirm validity of this data
- ◆ analyse test results or investigation data
- ◆ maintain an activity log book throughout the duration of the project
- ◆ complete a project report which conforms to appropriate report standards, includes an evaluation of the project strategy and what the candidate has learnt from undertaking this project
- ◆ present details of the project 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.

General information for candidates

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

The Unit requires that you undertake a major complex project-based assignment in the field of Petroleum Engineering.

Engineering technicians and incorporated engineers are frequently involved in project work where a customer is defined as the end-user of the project Outcome. Such project work starts with understanding the customer requirements and translating these into a project brief, aim, specification and objectives. This leads into scheduling project activities to ensure that all objectives will be met in the allocated timescale of the project. It then proceeds to implementation of the project and applying appropriate verification strategies to ensure that the project Outcome is thoroughly tested as being fit-for-purpose. The final phase of a project is the overall evaluation of the Outcome and how it was achieved.

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

During this project 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 managing a project such as planning and organisation, communication, evaluative skills, time management and many others.

The HND course units will lay the foundations for this Graded Unit which will prepare you to undertake the tasks necessary to complete your project assignment. 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 project activity log book, submission of a comprehensive written report and the delivery of a short oral 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.