National Added Value Unit Specification

Unit title: Engineering Science Assignment (National 4)

SCQF: level 4 (6 SCQF credit points)

Unit code: to be advised

Unit outline

This is the Added Value Unit in the Engineering Science (National 4) Course. The general aim of this Unit is to enable the learner to provide evidence of added value for the Engineering Science (National 4) Course through the successful completion of an assignment which will allow the learner to demonstrate challenge and application.

Learners who complete this Unit will be able to:

1 Develop, with guidance, an engineering solution which will draw on and apply skills and knowledge of mechanical, electrical and electronic systems

This Unit is a mandatory Unit of the Engineering Science (National 4) Course and is also available as a free-standing Unit. The Unit Specification should be read in conjunction with the *Course Support Notes*, which provide advice and guidance on delivery and assessment approaches. Exemplification of the assessment in this Unit is given in the *National Assessment Resource*.

Recommended entry

Entry to this Unit is at the discretion of centre. It is recommended that the learner should be in the process of completing, or have completed, the Units of the Engineering Science (National 4) Course:

- Engineering: Contexts and Challenges (National 4)
- Mechanical Systems (National 4)
- Electrical and Electronic Systems (National 4)

Equality and inclusion

This Unit Specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. For further information please refer to the *Course Support Notes.*

Standards

Outcomes and assessment standards

Outcome 1

The learner will:

1 Develop, with guidance, an engineering solution which will draw on and apply skills and knowledge related to mechanical, electrical and electronic systems by:

1.1 Analysing a straightforward problem
1.2 Designing a solution to the problem
1.3 Simulating or constructing a solution to the problem
1.4 Testing and reporting on the solution to the problem

Evidence Requirements for the Unit

Evidence for this Unit will be generated through an assignment in which the learner will draw on and apply skills and knowledge related to mechanical, electrical and electronic systems.

This Added Value Unit is assessed internally by the teacher/lecturer.

The assignment will assess learners' skills in analysing a problem, designing a solution to the problem, simulating or constructing a solution to the problem, and testing and reporting on that solution.

Some possible exemplar topics for the assignment are suggested in the *Course Support Notes.*

- The specification for the assignment will be agreed between the learner and the teacher/lecturer.
- The assignment should clearly demonstrate application of knowledge and skills, at an appropriate level, related to mechanical, electrical and electronic systems (as defined in the 'Further mandatory information on Course coverage' section of this document).
- The teacher/lecturer will provide overall guidelines for the assignment and a list of questions/tasks/prompts which will lead learners through the assignment in clear stages.
- The assignment will be carried out under supervised open book conditions.
- The teacher/lecturer may also give learners some support and guidance, as appropriate to National 4 level, to help them progress through each stage of the assignment. The amount of support provided should be reflected in the assessment judgement.
- The assignment will be a meaningful and appropriately challenging task. Within the notional 40 hours for the Unit, time will be required for:
  - preparation for the assignment, which could include considering exemplar assignments and practising the application and integration of skills
  - carrying out the stages of the assignment, with teacher guidance and support
  - assessing the process and completed solution
  - providing opportunities for re-assessment if required

- Evidence should include:
  - the completed solution
  - a record of progress through the assignment (such as an informal log or blog produced by the learner)
  - a short report on the testing of the solution (in written, electronic or oral form)

Further information is provided in the exemplification of assessment in the *National Assessment Resource*. Advice and guidance on possible approaches to assessment is provided in the *Course Support Notes.*

Development of skills for learning, skills for life and skills for work

Please refer to the Course Specification for information about skills for learning, skills for life and skills for work.

Further mandatory information on Course coverage for the Engineering Science (National 4) Course

The following gives details of mandatory skills, knowledge and understanding for the Engineering Science (National 4) Course. Assessment of this Added Value Unit will involve selecting appropriate skills, knowledge and understanding from those listed below, in line with the Evidence Requirements above. This list of skills, knowledge and understanding also provides the basis for the assessment of all the Units in the Course:

Engineering: Contexts and Challenges
Systems approach:

- systems and sub-systems diagrams
- systems analysis of environmental control system
- systems analysis of a renewable energy system
- working of simple engineered objects
- energy transfers, changes and losses

Engineering roles and disciplines:

- applications of environmental, civil, structural, mechanical, electrical and electronic engineering
- roles of engineers in designing, implementing, testing and controlling systems

Impacts of engineering:

- social, economic and environmental impacts
- impacts of a renewable energy project on the environment and community
- contribution of engineering to tackling climate change

Electrical and Electronic Systems
Analogue electronic control systems:

- symbols, and simple description of function of: battery; switch; resistor; variable resistor; LDR; thermistor, LED; diode; motor; lamp; ammeter and voltmeter
- voltage, current and resistance; measurement using a meter
- explanation of operation of fixed voltage divider
- use of a fixed voltage divider to generate a signal
- use of resistors in electronic systems for component protection
- function of a relay and a protection diode in an electronic circuit

Digital electronic control systems:

- AND, OR and NOT gates using truth tables
- use of correct symbols (start, stop, branch, loop) to construct flowcharts of simple control programs

Mechanical Systems
Drive systems:

- rotary, linear, reciprocating and oscillating motion
- simple gear trains and idlers, belt drives and chain drives
- calculation of speed (velocity) ratio
- the effect of friction in drive systems

Pneumatics:

- use of fluid (air) to produce linear movement
- logic control of pneumatic circuits
- calculation of relationships between force, pressure and area

Structures and forces:

- effects of a force
- concurrent forces, equilibrium
- use of triangle of forces and free-body diagrams

Materials:

- compression, tension and bending

Energy and efficiency:

- names of forms of energy
- energy sources
- the law of conservation of energy
- energy transfers, losses and transformations in a system
- calculations involving efficiency, work done and power, using: $W = Fs$, $P = W/t$, $\eta = W_{out}/W_{in} = P_{out}/P_{in}$

Administrative information

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Superclass: to be advised

History of changes

Version	Description of change	Authorised by	Date