

National Unit Specification: general information

UNIT	Energy (Intermediate 2)
NUMBER	D185 11
COURSE	Technological Studies (Intermediate 2)

SUMMARY

This unit is designed to enable candidates to study different forms of energy and describe how they are converted and transmitted within systems.

OUTCOMES

- 1 Identify and quantify various forms of energy and work done.
- 2 Describe how energy is converted and transferred within a system.
- 3 Carry out measurements and calculations on energy transfer processes.
- 4 Carry out calculations relating to an energy audit for a system.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained the following:

- Standard Grade Technological Studies at grade 3 or 4

CREDIT VALUE

0.5 credit at Intermediate 2.

Administrative Information

Superclass:	RC
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National Unit Specification: statement of standards

UNIT Energy (Intermediate 2)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Identify and quantify various forms of energy and work done.

Performance criteria

- (a) Various forms of energy are identified correctly.
- (b) Simple calculations relating to energy, power and work done are carried out correctly.

Note on range for the outcome

Forms of energy: potential, kinetic, strain, electrical, thermal.

Calculations: $E_p = mgh$, $E_k = \frac{1}{2}mv^2$, $E_s = \frac{1}{2}Fx$, $E_e = VIt$, $E_h = Cm\Delta T$, $W = Fs$, $P = \frac{E}{t}$.

Evidence requirements

Written and graphical evidence for PCs (a) and (b).

OUTCOME 2

Describe how energy is converted and transferred within a system.

Performance criteria

- (a) Forms of energy are identified correctly at various stages within a system.
- (b) Energy changes within a system are described correctly.
- (c) The main energy losses from a system are identified and explained clearly.

Note on range for the outcome

Forms of energy: potential, kinetic, strain, electrical, thermal.

System: any system with 2 to 4 energy transfers.

Evidence requirements

Written and graphical evidence for PCs (a) to (c).

National Unit Specification: statement of standards (cont)

UNIT Energy (Intermediate 2)

OUTCOME 3

Carry out measurements and calculations on energy transfer processes.

Performance criteria

- (a) Simple measurements relating to mass, force, temperature and time are carried out accurately using appropriate equipment.
- (b) Calculations of energy transfers are carried out correctly.

Evidence requirements

Performance evidence for PC (a). Written and graphical evidence for PC (b).

OUTCOME 4

Carry out calculations relating to an energy audit for a system.

Performance criteria

- (a) Calculations of energy inputs to a system are carried out correctly.
- (b) Calculations of energy outputs from a system are carried out correctly.
- (c) Calculations of energy losses for a system are carried out correctly.
- (d) Calculation of the overall efficiency of a system is carried out correctly.

Evidence requirements

Written and graphical evidence for PCs (a) to (d).

National Unit Specification: support notes

UNIT Energy (Intermediate 2)

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

While the time allocated to this unit is at the discretion of the centre, the notional design length is 20 hours.

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

A data booklet will be issued by SQA in connection with this unit.

Guidance for each outcome is given below.

Outcome 1 Forms of energy: potential, kinetic, strain, electrical, thermal, work done, power.

Calculations: $E_p = mgh$, $E_k = \frac{1}{2}mv^2$, $E_s = \frac{1}{2}Fx$, $E_e = VIt$, $E_h = Cm\Delta T$, $W = Fs$, $P = \frac{E}{t}$.

Outcome 2 System: any system which involves 2–4 energy transfers.

Description of energy transfers within energy system.

Principle of energy conservation and energy losses.

Outcome 3 Energy transfer processes: measurement of energy transfers, calculations relating to energy transfers.

Outcome 4 Calculations relating to energy inputs, outputs, energy losses and efficiency, $\eta = \frac{\text{Energy out}}{\text{Energy in}}$.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

The purpose of the Energy unit is to develop abilities in recognising and measuring energy forms and calculating energy conversions. Candidates should be able to analyse energy conversions and transformations and to apply this knowledge to the energy audit of a system. The need for an energy audit should be clearly understood, along with its use in seeking to improve the overall efficiency of a system.

Every opportunity should be taken to ensure that the learning and teaching contexts are of an industrial nature and are seen to be relevant by the candidate. Candidates are expected to develop control sequences to control mechatronic systems.

In presenting courses, teachers and lecturers should ensure that there is a balance between direct teaching and candidate-centred activities.

National Unit Specification: support notes (cont)

UNIT Energy (Intermediate 2)

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

National Assessment Bank materials have been created specifically to assess knowledge and understanding for each outcome. Assessments can take place either at the completion of an outcome or as an end of unit test. Centres must ensure that tests are conducted under appropriate conditions. Candidates should be allowed to use the Technological Studies data booklet. Candidates should be issued with clean copies of this booklet for use during tests.

Outcome 3 requires candidates to carry out measurements on an energy transfer. Details should be recorded of the particular system dealt with by each candidate. It is the responsibility of the centre to ensure that evidence of candidate performance is recorded in an appropriate way. All evidence of performance must be retained by the centre. The assessment of this unit is subject to central moderation by the SQA.

Candidates generate evidence by means of their response to written tests, proficiency in practical activities and systems evaluation. Details should be recorded of the particular system used by each candidate.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).