National Unit Specification: general information

UNIT Structures and Materials (Advanced Higher)

NUMBER D190 13

COURSE Technological Studies (Advanced Higher)

SUMMARY

This unit is designed to enable candidates to apply engineering principles to analyse static loads on structural systems and calculate the effect of loading on individual members.

OUTCOMES

1 Apply the general bending equation in solving problems on idealised beams.
2 Evaluate the distribution of shear force and bending moment in loaded beams.
3 Apply the method of sections in solving problems on complex framed structure systems.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained Higher Technological Studies at grade A, B or C or to have completed equivalent units.

CREDIT VALUE

0.5 credit at Advanced Higher.

CORE SKILLS

Core Skills for Advanced Higher remain subject to confirmation and details will be available at a later date.

Administrative Information

Superclass: RC

Publication date: April 2000

Source: Scottish Qualifications Authority

Version: 02

National Unit Specification: statement of standards

UNIT Structures and Materials (Advanced Higher)

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

Apply the general bending equation in solving problems on idealised beams.

Performance criteria

(a) Tabulated and graphical data are used appropriately in selecting materials and common/standard sections, to meet a specification for a simple beam design.
(b) Calculations to determine the specification for a loaded beam are carried out correctly, using the general bending equation.
(c) Calculations to determine the deflection of a loaded beam are carried out correctly.

Evidence requirements

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

OUTCOME 2

Evaluate the distribution of shear force and bending moment in loaded beams.

Performance criteria

(a) Force systems are represented correctly using free body diagrams.
(b) Calculations to determine the magnitude of support reactions are carried out correctly.
(c) Shear force and bending moment diagrams are produced correctly.
(d) Maximum shear force and bending moment in a loaded beam are evaluated correctly.

Evidence requirements

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

National Unit Specification: statement of standards (cont)

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Outcome 3

Apply the method of sections in solving problems on complex framed structure systems.

Performance criteria

(a) The conditions of static equilibrium are applied correctly to complex structural systems.
(b) Calculations to determine the magnitude and direction of support reactions are carried out correctly.
(c) The method of sections is applied correctly in solving complex framed structure problems.
(d) The magnitude and nature of forces in specified frame members are evaluated correctly.

Evidence requirements

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

National Unit Specification: support notes

UNIT Structures and Materials (Advanced Higher)

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

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

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

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

Guidance for each outcome is listed below.

Outcome 1	Calculations: use of the general bending equation ($\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{r}$), second moment of area (for common and simple non-standard sections), deflection, bending stress. Factors affecting beam design: span, bending moment, Young's modulus, depth of beam.
Outcome 2	Load systems to include any number of point loads and uniformly distributed loads. Beam types: cantilevers, simply supported and fixed beams. Shear force and bending moment diagrams: including UDLs, point loads and combinations of these. Loading effects: compression and tension in bending. Stress distribution diagram: position of maximum stress on the surface of the beam. Design features: thin-wall webs, flanges, weight reduction along the neutral axis. Calculations: bending moment, maximum deflection.
Outcome 3	Conditions of static equilibrium: forces in the vertical plane, forces in the horizontal plane, moment equilibrium. Frame structure: complex frameworks. Support reactions: roller, hinge. Use of method of sections to determine the magnitude and nature of force in up to three members of a complex framed structural system.

The use of appropriate units and appropriate sign conventions is required throughout this unit.

National Unit Specification: support notes (cont)

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GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Every opportunity should be taken to ensure that the teaching and learning contexts are of an industrial nature and are seen as relevant by the candidate. Opportunities should be taken where possible to relate content to other units of the course.

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

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 on 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 Advanced Higher data booklet. Candidates should be issued with clean copies of this booklet for use during tests.

Candidates generate evidence by means of their response to written tests.

In order to gain success in the written test for an outcome, each candidate must achieve the cut-off score for that outcome. The assessment of this unit is subject to moderation by SQA.

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).*