

-SQA-SCOTTISH QUALIFICATIONS AUTHORITY

HIGHER NATIONAL UNIT SPECIFICATION

GENERAL INFORMATION

-Unit Number- 2451737
-Superclass- WD
-Title- INSTRUMENT SYSTEMS

-DESCRIPTION-

GENERAL COMPETENCE FOR UNIT: Explaining the use of instrumentation in control systems.

OUTCOMES

1. explain the principles of instrument systems;
2. explain the principles of signal processing methods.

CREDIT VALUE: 0.5 HN Credit

ACCESS STATEMENT: Access to this unit is at the discretion of the centre. However, it may be beneficial if the candidate had prior knowledge of basic electrical and electronic principles.

For further information contact: Committee and Administration Unit, SQA, Hanover House, 24 Douglas Street, Glasgow G2 7NQ.

Additional copies of this unit may be purchased from SQA (Sales and Despatch section). At the time of publication, the cost is £1.50 (minimum order £5.00).

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STATEMENT OF STANDARDS

UNIT NUMBER: 2451737

UNIT TITLE: INSTRUMENT SYSTEMS

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

OUTCOME

1. EXPLAIN THE PRINCIPLES OF INSTRUMENT SYSTEMS

PERFORMANCE CRITERIA

- (a) The preparation of a functional block diagram of a general measuring system is correct.
- (b) The explanation of the function of each block is clear.
- (c) The explanation of the nature of random and systematic errors in instrumentation systems is correct.
- (d) The description of analogue and digital instrument systems is correct.

RANGE STATEMENT

Functional blocks: measurand; transducer; signal conditioning; display.

Analogue systems: analogue input; analogue output.

Digital systems: analogue input; analogue to digital conversion; digital output.

EVIDENCE REQUIREMENTS

Written and/or oral evidence of the candidate's ability to explain the principles of instrument systems, as specified in PCs (a) to (d).

OUTCOME

- 2. EXPLAIN THE PRINCIPLES OF SIGNAL PROCESSING METHODS

PERFORMANCE CRITERIA

- (a) The explanation of the need for signal processing in instrument systems is clear.
- (b) The description of signal conditioning and processing methods is correct.
- (c) The explanation of the need for signal conversion techniques is correct.

RANGE STATEMENT

Signal processing: analogue; digital.

Signal conditioning: bridge circuits; operational amplifiers; amplification; analogue filters; integration; differentiation.

EVIDENCE REQUIREMENTS

Written and/or oral evidence of the candidate's ability to explain the principles of signal processing methods, as specified in PCs (a) to (d).

MERIT To gain a pass in this unit, a candidate must meet the standards set out in the outcomes, performance criteria, range statements and evidence requirements.

To achieve a merit in this unit, a candidate must demonstrate a superior or more sophisticated level of performance. This may be demonstrated by:

- (i) a more-in-depth explanation of principles.

ASSESSMENT

In order to achieve this unit, candidates are required to present sufficient evidence that they have met all the performance criteria for each outcome within the range specified. Details of these requirements are given for each outcome. The assessment instruments used should follow the general guidance offered by the SQA assessment model and an integrative approach to assessment is encouraged. (See references at the end of support notes).

Accurate records should be made of the assessment instruments used showing how evidence is generated for each outcome and giving marking schemes and/or checklists, etc. Records of candidates' achievements should be kept. These records will be available for external verification.

SPECIAL NEEDS

Proposals to modify outcomes, range statements or agreed assessment arrangements should be discussed in the first place with the external verifier.

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SUPPORT NOTES

UNIT NUMBER: 2451737

UNIT TITLE: INSTRUMENT SYSTEMS

SUPPORT NOTES: This part of the unit specification is offered as guidance. None of the sections of the support notes is mandatory.

NOTIONAL DESIGN LENGTH: SQA allocates a notional design length to a unit on the basis of time estimated for achievement of the stated standards by a candidate whose starting point is as described in the access statement. The notional design length for this unit is 20 hours. The use of notional design length for programme design and timetabling is advisory only.

PURPOSE This unit is intended as an introduction to instrument systems for non-specialists as part of an HNC/HND programme.

CONTENT/CONTEXT

Outcome 1

Simple block diagram with interconnections showing the signal flow from input to output. A brief explanation describing the purpose of each block.

The existence of uncertainty in all measurements, differentiating between systematic errors and random errors.

The continuous and discrete nature of analogue and digital signals respectively. Advantages and disadvantages of both types.

Outcome 2

Signal processing/conditioning used to improve the quality of the signal such as amplification and filtering or to modify the shape/linearity of the signal.

Analogue to digital and digital to analogue conversion. Perhaps also voltage/frequency conversion.

APPROACHES TO GENERATING EVIDENCE The unit could be delivered with the minimum of formal input with students carrying out an investigation. Students will be expected to submit a structured report to cover the unit. Practical demonstrations can be used if suitable equipment is available.

ASSESSMENT PROCEDURES Centres may use Instruments of Assessment which are considered by tutors to be most appropriate.

Outcome 1 could be assessed by a test comprising short answer or restricted response questions.

Outcome 2 could be assessed by a written report following investigations by candidates.

PROGRESSION This unit does not progress onto any other unit.

REFERENCES

1. Guide to unit writing.
2. For a fuller discussion on assessment issues, please refer to SQA's Guide to Assessment.
3. Information for centres on SQA's operating procedures is contained in SQA's Guide to Procedures.
4. For details of other SQA publications, please consult SQA's publications list.

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