National Unit Specification: general information

UNIT Artificial Intelligence (Intermediate 2)

NUMBER DF31 11

COURSE Computing (Intermediate 2)

SUMMARY
This Unit is designed to develop basic knowledge and understanding of the principles of artificial intelligence together with some of the concepts associated with the representation and processing of knowledge. Students are also provided an opportunity to apply this knowledge to solve simple practical problems through the use of contemporary hardware and software. It is designed as an option for candidates undertaking the Intermediate 2 Computing Course, but is also suitable for anyone wishing to develop a basic understanding of artificial intelligence

OUTCOMES
1. Demonstrate knowledge and understanding of a range of basic facts, ideas and terminology relevant to the development, applications and features of artificial intelligence.
2. Demonstrate practical skills in the context of artificial intelligence using contemporary software and hardware.

RECOMMENDED ENTRY
While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following or equivalent:

- Intermediate 1 Computing Studies
- Standard Grade Computing Studies at General level

Administrative Information

Superclass: CB

Publication date: April 2004

Source: Scottish Qualifications Authority

Version: 01

National Unit Specification: general information (cont)

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CREDIT VALUE
1 credit at Intermediate 2 (6 SCQF credit points at SCQF level 5*).

**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.*

CORE SKILLS
There is no automatic certification of Core Skills or Core Skill components in this Unit.

National Unit Specification: statement of standards

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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

Demonstrate knowledge and understanding of a range of basic facts, ideas and terminology relevant to the development, applications and features of artificial intelligence.

Performance Criteria

a) Basic computing terminology is used appropriately.
b) Simple descriptions and explanations are related to practical and familiar contexts.
c) Simple conclusions, predictions and generalisations are made from knowledge and understanding.

Evidence Requirements

Written or oral evidence that the candidate can describe and explain the development, applications and features of artificial intelligence accurately and correctly. Evidence should be obtained using questions in a closed book test, under supervision, lasting no more than 45 minutes. The test must sample content (see Computing Intermediate 2 Course content) in the following area:

- the development of artificial intelligence
- applications and uses of artificial intelligence
- search techniques
- knowledge representation

(The content statements are also reproduced for convenience as a table in the support notes for this Unit).

The standard to be applied is illustrated in the National Assessment Bank items available for this Unit. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

National Unit Specification: statement of standards (cont)

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OUTCOME 2
Demonstrate practical skills in the context of artificial intelligence using contemporary software and hardware.

Performance Criteria
a) A range of appropriate hardware and software is used effectively.
b) Common features of declarative languages are selected and used effectively.
c) Practical tasks are planned and organised with detailed guidance.
d) Practical tasks are undertaken in an appropriate range of simple contexts.

Evidence Requirements
Observational checklist showing that the candidate has demonstrated the following skills in the context and at a level defined by the content statements (see Computing (Intermediate 2) Course content):

- construction of a knowledge base of facts and simple rules from a semantic net
- creation of simple queries to elicit information from a knowledge base
- testing a knowledge base
- consulting a simple expert system

Hard copy evidence should be provided of the knowledge base constructed.

The practical skills may all be demonstrated in a single extended task, or in a number of smaller tasks.

The candidate will be allowed access to books, notes and online help while completing the task(s).

(The content statements are also reproduced for convenience as a table in the support notes for this Unit).

The standard to be applied is illustrated in the National Assessment Bank items available for this Unit. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

National Unit Specification: support notes

UNIT Artificial Intelligence (Intermediate 2)

This part of the Unit Specification is offered as guidance.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

The content for this Unit is detailed below (and also in the National Course Specifications: Course details.)

Content Statement: The Development of Artificial Intelligence
Description of human intelligence (including the ability to communicate, retain knowledge, solve problems). Description of the Turing test and explanation of its rationale.
Explanation of the need for a different approach to programming which could represent knowledge.
Simple description of ♦ the development of game playing programs from simple early examples to contemporary complex examples exhibiting intelligence ♦ the development of language processing from Eliza to chatterbots and contemporary applications ♦ the development of expert systems
Identification of hardware developments (including faster processors, more memory, and increasing backing store capacity) which have assisted the development of AI.

Content Statement : Applications and Uses of Artificial Intelligence
Artificial neural systems Simple description of a neural network as an electronic model of the brain consisting of many interconnected simple processors. Description of uses and examples of artificial neural systems (including learning to read postcodes; stock market prediction; debt risk assessment; other examples of pattern recognition). Description of advantages and disadvantages of artificial neural systems.
Vision systems Explanation of the need to interpret/make sense of visual input. Description of applications (including industrial, military use, satellite photo interpretation).
Speech recognition Description of applications (including word processor, punctuation commands, disabled users, cars, military, mobile phones). Description of characteristics (training for each voice pattern, control instructions, influence of background noise, factors affecting accuracy).

National Unit Specification: support notes (cont)

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Content Statement : Applications and Uses of Artificial Intelligence (cont.)
Handwriting recognition: Description of common applications (including palmtops and tablet PCs). Explanation of possible need to train the system.
Intelligent robots: Description of: ♦ types of sensors used ♦ contemporary applications (including automated delivery, pipe inspection, bomb disposal, exploration of unknown environments) ♦ advantages of intelligent robots
Expert systems: Description of purpose of expert systems. Description of advantages of expert systems over human experts, including: ♦ expertise always available ♦ reduced wage bill ♦ combines expertise of several experts ♦ less chance of errors Description of contemporary applications of expert systems. Description of social, legal and ethical issues related to the use of expert systems (including loss of jobs, training issues, public reactions, loss of human expertise).

Content Statement: Search techniques
Exemplification of problem solving by search. Construction of a simple search tree. Description of breadth-first and depth-first search and exemplification on a search tree.

Content Statements: Knowledge Representation
Construction of semantic net to represent simple relationships and facts.
Description and exemplification of the following features in Prolog (or similar declarative language): ♦ Simple facts (single/double argument) ♦ Simple rules (up to two sub-goals) ♦ Simple queries (true/false, single variable) ♦ Operators: and, >, < ,=
Explanation of the concepts of goals and sub-goals.
Perform simple manual trace: one rule/level.

National Unit Specification: support notes (cont)

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GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Candidates will require individual access to appropriate computer hardware and software throughout this Unit.

The two Outcomes should be delivered in an integrated way rather than sequentially. For Outcome 2, the practical activities should be taught and used to illustrate and exemplify the knowledge and understanding required for Outcome 2, whenever this is possible. At the very least, candidates should carry out practical tasks using Prolog, and have experience of consulting a simple expert system system which could be a simple one prepared for the purpose, or a commercial example. Practical illustrations of other applications and uses of artificial intelligence should be provided where suitable hardware and software is available.

The amount of time spent on each area of content will vary depending on the teaching methodology used and the ability and prior experience of the candidates. However, the following times are suggested as a rough guide:

development of artificial intelligence	6 hours
applications and uses of artificial intelligence	12 hours
search techniques	4 hours
knowledge representation	14 hours

1½ hours should be set aside to:

- administer the Outcome 1 test
- gather evidence for Outcome 2

A further 2½ hours is allowed for remediation and re-assessment if required.

If the Unit is delivered as part of a Course, the Course documentation will provide further information on teaching and learning in a Course context, including the identification of a number of 'themes' to facilitate holistic learning across the Course.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

National Assessment Bank tests have been created specifically to assess Outcome 1 of the Unit. This assessment consists of a closed book test, and must be conducted under examination conditions. In order to gain success in this Outcome, the candidate must achieve at least the cut-off score for the test. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard

Outcome 2 requires the candidate to demonstrate practical skills while using contemporary hardware and software. These practical skills will normally be demonstrated in a number of relatively small tasks. The skills will normally be demonstrated by the candidate during the teaching and learning activities of the Unit, rather than during separate formal assessment activities. The candidate will be allowed access to books, notes and online help while demonstrating the skills. The practical skills should be demonstrated in the context and at a level defined by the content statements (see Computing (Intermediate 2) Course content).

National Unit Specification: support notes (cont)

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To gain success in this Outcome, the candidate must demonstrate practical skills in the following contexts:

- construction of a knowledge base of facts and simple rules from a semantic net
- creation of simple queries to elicit information from a knowledge base
- testing a knowledge base
- consulting a simple expert system

Hard copy evidence should be provided of the knowledge base constructed.

Note: the candidate is only required to test an expert system, not to construct one.

A pro-forma observation checklist for Outcome 2 is provided in the National Assessment Bank materials.

All evidence must be retained by the centre. 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 special alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, September, 2003).