



## **Design and Manufacture (National 5)**

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### **Draft National Course Assessment Specification**

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Please refer to the note of changes at the end of this Course Assessment Specification for details of changes from previous version (where applicable).

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# Course outline

<b>Course title:</b>	Design and Manufacture (National 5)
<b>SCQF level:</b>	5 (24 SCQF credit points)
<b>Course code:</b>	to be advised
<b>Course assessment code:</b>	to be advised

The purpose of the Course Assessment Specification is to ensure consistent and transparent assessment year on year. It describes the structure of the Course assessment and the mandatory skills, knowledge and understanding that will be assessed.

## Course assessment structure

Component 1 — assignment	90 marks
Component 2 — question paper	60 marks
<b>Total marks</b>	<b>150 marks</b>

This Course includes six SCQF credit points for 40 additional programmed hours to allow preparation for Course assessment. The Course assessment covers the added value of the Course.

## Equality and inclusion

This Course Assessment Specification has been designed to ensure that there are no unnecessary barriers to assessment. Assessments have been designed to promote equal opportunities while maintaining the integrity of the qualification.

For guidance on assessment arrangements for disabled learners and/or those with additional support needs, please follow the link to the Assessment Arrangements web page: [www.sqa.org.uk/sqa/14977.html](http://www.sqa.org.uk/sqa/14977.html).

Guidance on inclusive approaches to delivery and assessment of this Course will be provided in the *Course Support Notes*.

# Assessment

To gain the award of the Course, the learner must pass all the Units as well as the Course assessment. Course assessment will provide the basis for grading attainment in the Course award.

## Course assessment

SQA will produce and give instructions for the production and conduct of Course assessments based on the information provided in this document.

## Added value

The purpose of the Course assessment is to assess added value of the Course as well as confirming attainment in the Course and providing a grade. The added value for the Course will address the key purposes and aims of the Course as defined in the Course Rationale. It will do this by addressing one or more of breadth, challenge, or application.

In this Course assessment, added value will focus on the following:

- ◆ breadth — drawing on knowledge and skills from across the Course
- ◆ challenge — requiring greater depth or extension of knowledge and/or skills
- ◆ application — requiring application of knowledge and/or skills in practical or theoretical contexts as appropriate

The added value consists of the following.

Through the Units, learners will develop skills, and knowledge and understanding of key concepts related to design and manufacture. To achieve success in the Course, learners must show that they can apply this knowledge and these skills to solve design problems in both practical and theoretical contexts.

The assignment requires learners to demonstrate aspects of challenge and application in a practical context. Learners will apply knowledge and skills from the Units to produce a solution to an appropriately challenging design problem.

The question paper requires learners to demonstrate aspects of breadth and application in theoretical contexts. Learners will apply breadth of knowledge from across the Units and depth of understanding, to produce descriptions and explanations related to theoretical design and manufacture contexts.

## Grading

Course assessment will provide the basis for grading attainment in the Course award.

The Course assessment is graded A–D. The grade is determined on the basis of the total mark for all Course assessments together.

A learner's overall grade will be determined by their performance across the Course assessment.

**Grade description for C**

For the award of Grade C, learners will have demonstrated successful performance in all of the Units of the Course. In the Course assessment, learners will typically have demonstrated successful performance in relation to the mandatory skills, knowledge and understanding for the Course.

**Grade description for A**

For the award of Grade A, learners will have demonstrated successful performance in all of the Units of the Course. In the Course assessment, learners will typically have demonstrated a consistently high level of performance in relation to the mandatory skills, knowledge and understanding for the Course.

**Credit**

To take account of the extended range of learning and teaching approaches, remediation, consolidation of learning and integration needed for preparation for external assessment, six SCQF credit points are available in Courses at National 5 and Higher, and eight SCQF credit points in Courses at Advanced Higher. These points will be awarded when a grade D or better is achieved.

## **Structure and coverage of the Course assessment**

The Course assessment will consist of two Components: an assignment, titled 'Design Assignment', and a question paper. The question paper will have two Sections.

### **Component 1 — assignment**

The purpose of the assignment is to assess the candidate's ability to apply skills, knowledge and understanding to solve a design task in a given context. It assesses the candidate's ability to communicate, generate and refine ideas and apply practical skills in producing a potential solution.

This assignment will give learners an opportunity to demonstrate the following skills, knowledge and understanding:

- ◆ skills in idea generation and refinement
- ◆ the ability to communicate
- ◆ practical skills as described above
- ◆ the ability to apply knowledge and understanding and practical skills

The assignment will have 90 marks (60% of the total mark).

The context of the Design Assignment task will be based on:

- ◆ a problem situation
- ◆ a design brief
- ◆ relevant research
- ◆ a design specification

The Design Assignment task will allow candidates the opportunity to produce a prototype of their potential solution.

The Design Assignment will assess two areas:

#### **Design Skills** (50% of Design Assignment marks)

Candidates will produce a folio covering the following areas:

- ◆ ideas
- ◆ development
- ◆ communication
- ◆ evaluation

### **Practical Skills (50% of Design Assignment marks)**

Candidates will produce a prototype in order to evaluate their solution to the Design Assignment task.

The prototype will allow learners to demonstrate practical skills in:

- ◆ measuring and marking out
- ◆ cutting, shaping and forming
- ◆ assembly of components
- ◆ finishing

The prototype will also allow learners to demonstrate consistency of application of practical skills which will be evident in its overall quality, effectiveness and performance.

The Design Assignment is conducted over an extended period of time. This allows candidates the opportunity to develop, reflect on and revise their work. Consequently, this will probably be the candidate's 'best work'.

### **Component 2 — question paper**

The purpose of the question paper is to assess the candidate's ability to retain and integrate knowledge and understanding from across the Course content.

This assignment will give learners an opportunity to demonstrate the following skills, knowledge and understanding:

- ◆ knowledge and understanding of how products are influenced by materials and processes
- ◆ knowledge and understanding of the use of tools
- ◆ knowledge of how products are influenced by design factors

The question paper will have 60 marks (40% of the total mark).

The question paper will have two Sections.

**Section 1** will represent approximately 40% of the total marks for the question paper. It will consist of a single question, based on a product, and will require extended and reasoned responses. The question will follow a similar format each year and will test the candidate's knowledge and understanding of core areas from across the Course. The question will also require the candidate to integrate this knowledge.

This question will focus on the manufacturing issues associated with a product, namely materials, tools and processes.

**Section 2** will represent approximately 60% of the total marks for the question paper. It will consist of four or five questions. The responses will require integration of knowledge and understanding from across the Course. Questions will be based on products which are illustrated or products with which the learners are familiar.

It will give learners an opportunity to demonstrate knowledge and understanding specified in the table provided in 'Further mandatory information on Course coverage' at the end of this Course Assessment Specification.

## **Setting, conducting and marking of assessment**

### **Question paper**

This question paper will be set and marked by SQA, and conducted in centres under conditions specified for external examinations by SQA. Learners will complete this in 1 hour and 30 minutes.

### **Controlled assessment — assignment**

This assignment is:

- ◆ set by SQA
- ◆ conducted under some supervision and control

Evidence will be internally marked by centre staff in line with SQA marking instructions.

All marking will be quality assured by SQA.

A bank of assignments will be provided by SQA and there will be a choice from that bank.

The assignment will be carried out under supervised open book conditions, to ensure that the work presented is the candidate's own work.

The teacher/lecturer may also give learners support and guidance to help them progress through each stage of the assignment; where a significant amount of support is provided, this should be reflected in the marks awarded.

While the learner may be provided with feedback to help them achieve the next stage of the assessment, they are not allowed to be re-assessed on stages already completed.

## Further mandatory information on Course coverage

The following gives details of mandatory skills, knowledge and understanding for the Design and Manufacture (National 5) Course. Course assessment will involve sampling the skills, knowledge and understanding. This list of skills, knowledge and understanding also provides the basis for the assessment of Units of the Course.

### Design and Manufacture: Design

#### Skills in designing

Analysis of a design brief

- ◆ **Identification** of problems and needs, needs and wants, analysis of the situation

Generation of a specification

- ◆ **Research techniques** such as use of search engines, measuring and recording, asking questions, surveys, using data

Generation and development of ideas

- ◆ **Idea generation techniques** such as morphological analysis, thought showering, modelling, mind mapping, sketching, model making, prototyping, reflecting [on previous work], expert opinion, analogy, transfer, lifestyle board, mood board, design stories
- ◆ **Use of models as they support design activity** such as scale models, fully crafted prototypes, computer-generated models
- ◆ **Use of modelling materials** such as woods, metals, plastics, paper, card, manufactured boards, wire and pipe cleaners, dense and expanded foams, clay modelling compound and smart modelling materials
- ◆ **Use of manual and CADD graphic techniques** such as working drawings, annotated sketches and drawings, perspective sketches, illustration and presentation techniques, scale and proportion
- ◆ **Use of presentation techniques** such as colour, shade and shadow, highlights, text, backgrounds

Application of design knowledge

- ◆ **Aesthetics:** shape, proportion, size, colour, contrast, harmony, texture, materials, fashion
- ◆ **Ergonomics:** establishing critical sizes, basic understanding of how humans interact with products, anthropometrics
- ◆ **Economics:** target market, market opportunities, market demand, maintenance requirements and repairs, value for money, consumer demand, cost, profit, product life cycle, types of production
- ◆ **Sustainability issues:** Ease of repair, reducing energy consumption, reducing amount of materials used, material selection, recycling, re-using and reducing, concept of upcycling, raw materials-effect on the environment

- ◆ **Performance:** ease of maintenance, strength and durability, ease of use, stability, material selection, construction, size

#### Planning for manufacture

- ◆ Materials lists, cutting lists and sequencing of manufacturing operations
- ◆ Reading of working drawings and diagrams including an appreciation of orthographic projection

#### Evaluating solutions

- ◆ **Product evaluation techniques:** surveys, user trials, comparisons with specifications and standards, the concept of function and fitness for purpose

#### Knowledge of design

- ◆ Impact of design technologies on the world of work and society
- ◆ The design team in industry

### Design and Manufacture: Materials and Manufacture

#### Manufacturing in the workshop

Knowledge and understanding of the following processes and tools. Use of a range of tools, processes and materials as required for design and manufacturing tasks undertaken.

#### Planning for manufacture

- ◆ Preparing materials, planning for practical tasks, assembly, selecting appropriate tooling and finishes, reading of working drawings and diagrams, including an appreciation of orthographic projection

#### Common tools and their use

- ◆ Hand tools: tenon saw, coping saw, hacksaw, panel saw, various types and sizes of file, hand vice, bench vice, engineer's vice, try square, sliding bevel, engineer's square, mallet, cross pein hammer, ball pein hammer, marking gauge, mortise gauge, micrometer, outside and inside callipers, vernier callipers, steel rule, scribe, dividers, odd-leg callipers, bevel edge chisel, mortise chisel and mortise drill, hand drill, hand sander, screwdriver, smoothing plane and jack plane, centre punch, jig saw, tin snips, sash cramps, G cramps
- ◆ Machine tools or portable power tools: sander, band-facer, drill-press, hollow chisel mortiser, lathe, scroll-saw

#### Fixing and joining techniques

- ◆ Standard joint types for woodworking: housing joints dowel joint, mortise and tenon joint, haunched and stopped mortise and tenon joints, cross halving joint, butt joint, screws, nailing or pinning, and glue)

- ◆ Thermal joining techniques for metals (spot welding and welding, brazing), adhesive bonding

- ◆ Cementing of plastics, other mechanical joining techniques (pop riveting, nuts and bolts), knock-down fittings and use of proprietary adhesives

#### Metalworking and associated processes

Cutting, shearing, notching, parallel and step turning, taper turning, drilling, knurling, annealing, hardening, tempering, filing, folding, bending, fitting and fixing, and in industry — casting, die-casting

#### Woodworking and associated processes

- ◆ Cutting, sizing, drilling, shaping, turning

#### Plastic work

- ◆ Cutting, drilling, filing, forming, bending and twisting, moulding and in industry, rotational moulding

#### Surface finishing

- ◆ Sanding/abrading, polishing, varnishing, oiling, staining, waxing, painting/lacquering, dip coating

#### **Manufacturing in industry**

- ◆ Computer-aided manufacture
- ◆ Benefits: (unit cost for mass production, quality assurance, globalisation, clean manufacturing); drawbacks: (breakdown, set up cost), awareness of rapid prototyping technology
- ◆ Identification of common industrial processes

#### The properties of common materials

- ◆ Softwoods, hardwoods, manufactured boards, ferrous and non-ferrous metals, thermoplastics and thermosetting plastics

#### The impact of manufacturing technologies and activities on the world of work and society

- ◆ Reduction in workforce, skilled workforce, cost of equipment, impact on environment (energy and pollution) and the measures that can be taken to support sustainability

#### Health and Safety

- ◆ Safe working practices and systems applicable to manufacturing activities, workshops or environments

# Administrative information

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**Published:** November 2011 (draft version 1.0)

**Superclass:** to be advised

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## History of changes

Course details	Version	Description of change	Authorised by	Date

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Note: You are advised to check SQA's website ([www.sqa.org.uk](http://www.sqa.org.uk)) to ensure you are using the most up-to-date version of the Course Specification.