

GCE AS and A Level Subject Criteria for Design and Technology

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The criteria

Introduction

AS and A level subject criteria set out the knowledge, understanding, skills and assessment objectives common to all AS and A level specifications in a given subject.

They provide the framework within which the awarding body creates the detail of the specification.

Aims and objectives

1. AS and A level specifications in Design and Technology should encourage learners to:
 - make use of tacit knowledge and reflective practices in order to work with tasks that are challenging and often require definition;
 - develop and sustain their creativity and innovative practice;
 - recognise and overcome challenges and constraints when working towards the production of high-quality products;
 - develop a critical understanding of the influences of the processes and products of design and technological activities from a contemporary and historical perspective;
 - draw on a range of skills and knowledge from other subject areas;
 - draw on and apply knowledge, understanding and skills of production processes to a range of design and technology activities;
 - develop an understanding of contemporary design and technology practices, and use digital technologies and information-handling skills to enhance their design and technological capability;
 - recognise the values inherent in design and technological activities, and develop critical evaluation skills in technical, aesthetic, ethical, economic, environmental, sustainable, social, cultural and entrepreneurial contexts.

Subject content

2. AS and A level specifications in Design and Technology should build on knowledge, understanding and skills established in other key stages.

3. Specifications should enable progression from AS to A2.

Knowledge, understanding and skills

4. All AS and A level specifications in Design and Technology (Technology and Design in Northern Ireland) must require learners to cover the design and technology skills, knowledge and understanding as set out below.
5. AS and A level specifications in Design and Technology should also enable learners to specialise in a cognate area or areas such as product design, systems and control, or food. In developing AS and A level specifications all focus areas should be of equal demand.
6. In AS specifications, appropriate knowledge, understanding and skills must be set in the following domains:
 - exploring materials, components and their uses;
 - understanding contemporary design and technology practices;
 - understanding processes of product development.
7. A level specifications must include:
 - in-depth study related to the chosen focus area;
 - the holistic application of knowledge and understanding in a product development process.

Skills

Communicating ideas and information

8. Develop appropriate approaches to:
 - using digital technology for designing, modelling and communicating;
 - communicating ideas and design possibilities;
 - recording and explaining design decisions;
 - communicating information to enable others to interpret design intentions.

Evaluating

9. Develop and use strategies to:

- determine the degree of accuracy required for products to perform as intended and choose suitable methods of measurement;
- identify and apply relevant external standards to their design tasks;
- gather evidence to assess the extent to which their work will meet needs or market opportunities;
- engage in feasibility studies on the practicability of proposed solutions to problems;
- use personal and external sources for evaluating products.

Designing

10. Develop and use strategies to:

- clarify tasks:
 - identify a wide range of user needs and explore the nature of problems to be solved, engaging in in-depth research and seeking specialist advice and information;
 - develop initial design briefs and outline/detailed specifications;
 - design for manufacturing, maintenance and product life and sustainability.
- generate and develop ideas:
 - use appropriate techniques to generate and explore ideas;
 - understand and use appropriate techniques to analyse and evaluate ideas.
- develop proposals:
 - use appropriate techniques to model detailed aspects of ideas and proposals;
 - use knowledge and understanding of the working characteristics of materials and components/ingredients, and restrictions imposed by equipment and processes to prepare detailed design proposals that meet specifications.

Planning

11. Develop strategies:

- using an awareness of industrial methods and approaches to design, manufacture and quality control;
- for selecting an appropriate range of equipment and processes to generate quality products;
- for organising and managing time and resources effectively, responding to changing circumstances;
- using digital technologies appropriately for planning and data handling;
- to encourage collaborative skills.

Making

- Use digital technologies appropriately for communicating, modelling, controlling and manufacturing.
- Work creatively, innovatively, safely and skilfully to produce high-quality products or outcomes.
- Experiment with techniques in order to improve and refine intended methods of realising a design.
- Demonstrate a detailed knowledge of the working properties and functions of materials and components/ingredients.
- Demonstrate care, precision and attention to detail in the use of equipment and materials.
- Manufacture appropriate outcomes working to plans that identify resources needed.
- Make use of a variety of planning approaches and work to agreed deadlines.
- Achieve optimum use of materials and components/ingredients by taking into account the relationship between:
 - material, form and manufacturing processes;
 - the scale of production;

- the environmental factors affecting disposal of waste, surplus and by-products;
- sustainability and costs.
- Consider outcomes by using and/or developing quality procedures, assessing the impact of actions by reviewing and establishing the best approach. Review the way the work plan is followed after considering its effectiveness in order to achieve improvements.
- Use and select appropriate methods of testing the performance of products against specified criteria and act on findings. Ensure through testing, modification and evaluation that the quality of outcomes is suitable for the intended user.

Knowledge and understanding

Materials and components

12. Learners should demonstrate the application and understanding of:
- a range of materials including modern materials;
 - properties and working characteristics of materials;
 - principles and techniques of testing;
 - methods of preparing, processing, manipulating and combining materials/ingredients to enhance their properties.

Industrial and commercial practice

13. Learners should demonstrate an understanding of:
- the main features of manufacturing industry, including human resources and commercial practices;
 - modern manufacturing systems;
 - stages of production;
 - detailed manufacturing methods, when combining or processing materials;
 - service to the customer, including legal requirements, availability of resources;

- the forms of energy used by industry, its impact on design, manufacturing, sustainability and the environment.

Quality

14. Learners should demonstrate and understand quality in terms of:

- fitness for purpose:
 - meeting the criteria of the specification;
 - accuracy of production;
 - appropriate use of technology;
 - aesthetics.
- the human need.

Health and safety

15. Learners should have a knowledge and understanding of:

- the regulatory and legislative frameworks for health and safety;
- safe working practices, including identifying hazards and making risk assessments.

Systems and control

16. Learners should have a knowledge and understanding of systems and control processes as appropriate to the focus area.

Products/outcomes and applications

17. Learners should develop knowledge and understanding of:

- the processes involved in the production of a range of manufactured products;
- the form, function and ergonomic requirements of different products;
- the impact of trends, styles, new technical capabilities, and social, political and ethical influences on design, production and sale of products;

- values (technical, economic, aesthetic, social, environmental, sustainable and moral) implicit in design and technology activities.

Assessment objectives

18. The assessment objectives and the associated weightings for AS and A level are the same. Knowledge, understanding, skills and their applications are closely linked. AS and A level specifications should require that all learners demonstrate the following assessment objectives in the context of the content and skills prescribed.
19. The assessment objectives are to be weighted in all specifications as indicated.

Assessment objectives	Weighting
AO1 Learners should demonstrate specific knowledge and understanding and be able to apply that knowledge and understanding in combination with appropriate skills in their designing, and should communicate ideas and outcomes and demonstrate strategies for evaluation	40–60%
AO2 Learners should be able to demonstrate and apply skills, knowledge and understanding of relevant materials, processes and techniques, and use materials and equipment to produce suitable and appropriate outcomes, and should communicate ideas and outcomes and demonstrate strategies for evaluation	40–60%

20. The assessment objectives apply to the whole specification for AS and A level.

Scheme of assessment

21. All specifications should ensure that there is a balance between the weighting of assessment of AS and A level content in the overall A level scheme of assessment.
22. In AS and A2 specifications the minimum weighting for internal assessment is 30 per cent and the maximum 60 per cent (with an upper limit of 60 per cent of the A2 component).

Internal assessment

23. Where internal assessment is included, specifications must make clear how reliability and fairness are secured, by setting out requirements that ensure the robustness of each stage of the internal assessment, for example:
- the specific skills to be assessed;
 - setting of tasks;
 - extent of supervision in carrying out of tasks;
 - conditions under which assessment takes place;
 - marking of the assessment and internal standardising procedures;
 - any moderation process.

Synoptic assessment

24. At A2, internal and external assessment must include tasks in which learners combine their designing and making skills with knowledge and understanding. Such tasks may vary in duration and the emphasis placed on particular assessment objectives may vary between them.

AS performance descriptions for Design and Technology

	Assessment objective 1	Assessment objective 2
Assessment objectives	Learners should demonstrate specific knowledge and understanding and be able to apply that knowledge and understanding in combination with appropriate skills in their designing and should communicate ideas and outcomes and demonstrate strategies for evaluation.	Learners should be able to demonstrate and apply skills, knowledge and understanding of relevant materials, processes and techniques and use materials and equipment to produce suitable and appropriate outcomes, and should communicate ideas and outcomes and demonstrate strategies for evaluation.
A/B boundary performance descriptions	<p>Learners characteristically:</p> <p>a) demonstrate specific knowledge and understanding of the working characteristics of materials, ingredients, components and their uses and/or systems and control:</p> <ul style="list-style-type: none"> ■ develop an appropriate brief and specification; ■ understand quality issues; ■ use correct technical language relevant to the task. <p>b) research and communicate a broad range of ideas and information effectively in a creative and innovative way through some recognition of values issues or uniqueness (for the learner) or connections with other ideas:</p>	<p>Learners characteristically:</p> <p>a) apply skills that demonstrate understanding of the working characteristics and potential application of a range of materials, ingredients, components and/or systems and control including preparation and processing:</p> <ul style="list-style-type: none"> ■ demonstrate that they understand the principles of testing materials and/or components. <p>b) demonstrate that they understand and can carry out appropriate making processes during product development/manufacture:</p> <ul style="list-style-type: none"> ■ understand and use safe working practices; ■ use appropriate skills in the development of a practical outcome.

	<ul style="list-style-type: none"> ■ demonstrate that they understand the main features of industrial and commercial practices related to manufacturing systems including the use of ICT and stages of production; ■ show that they understand health and safety issues through the regulatory and legislative framework. <p>c) demonstrate clear strategies for testing and evaluating by taking into account form and function of a product, trends and styles of products reflecting environmental, cultural and ethical/ moral issues as well as stylistic and engineering considerations:</p> <ul style="list-style-type: none"> ■ analyse and assess information and ideas in appropriate ways, including ICT, enabling others to interpret them. 	<p>c) communicate ideas and outcomes:</p> <ul style="list-style-type: none"> ■ refine and/or modify products and/or manufacturing methods; ■ use a range of criteria, for example social, economic, environmental, cultural, and ethical/moral considerations; <p>d) demonstrate clear strategies for testing and evaluating by analysing the planning, production and manufacturing methods.</p>
E/U boundary performance descriptions	<p>Learners characteristically:</p> <p>a) demonstrate some understanding of how their knowledge and understanding of materials, ingredients, components and their uses meet general design criteria:</p> <ul style="list-style-type: none"> ■ develop an outline brief and specification; 	<p>Learners characteristically:</p> <p>a) demonstrate that they understand the application of a limited range of materials, ingredients and components including their uses:</p> <ul style="list-style-type: none"> ■ demonstrate some knowledge of testing a material or component.

	<p>b) communicate ideas and information appropriately</p> <ul style="list-style-type: none">■ demonstrate that they understand at least one feature of industrial and commercial practices, a relevant manufacturing system and some stages of production; <p>c) demonstrate some strategies for testing and evaluating by taking into account form and function of a product and the need for appropriate modifications.</p>	<p>b) demonstrate that they understand and can carry out a limited range of making processes safely during product development:</p> <ul style="list-style-type: none">■ demonstrate that they understand how to plan for production. <p>c) communicate ideas and outcomes through a suitable development process and manufacturing method.</p> <p>d) demonstrate the ability to test and evaluate a limited range of manufacturing methods.</p>
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A2 performance descriptions for Design and Technology

	Assessment objective 1	Assessment objective 2
Assessment objectives	Learners should demonstrate specific knowledge and understanding and be able to apply that knowledge and understanding in combination with appropriate skills in their designing and should communicate ideas and outcomes and demonstrate strategies for evaluation.	Learners should be able to demonstrate and apply skills, knowledge and understanding of relevant materials, processes and techniques and use materials and equipment to produce suitable and appropriate outcomes, and should communicate ideas and outcomes and demonstrate strategies for evaluation.
A/B boundary performance descriptions	<p>Learners characteristically:</p> <p>a) demonstrate specific ability to analyse questions and/or contexts and select and explain relevant ways to proceed during in-depth study:</p> <ul style="list-style-type: none"> ■ take account of a wide range of factors and show knowledge and understanding of materials and manufacturing processes; ■ combine distinct elements of technical information in their responses; ■ develop an initial design brief and an outline specification and produce a design for manufacturing, considering maintenance and product life; ■ clarify the task during designing and making activities identifying a wide range of user needs and carry out in-depth research including some 	<p>Learners characteristically:</p> <p>a) demonstrate their understanding of systems and control and/or products and applications by discriminating between aspects of a system or product that perform and those that could be improved after in-depth study:</p> <ul style="list-style-type: none"> ■ demonstrate an understanding of reliable and quantifiable performances of a range of materials, components and production processes; ■ demonstrate applied knowledge of the working properties and functions of materials and components; ■ work safely, accurately and skilfully with materials, components, tools and processes including appropriate technologies to create high-

	<p>relevant primary research.</p> <p>b) originate a range of ideas and possible solutions when generating and developing proposals:</p> <ul style="list-style-type: none"> ■ apply knowledge and understanding to develop and refine their solutions, demonstrating evidence of creativity and innovation through recognition of values issues or uniqueness (for the learner) or connections with other ideas. <p>c) research, analyse and communicate a broad range of ideas and information effectively:</p> <ul style="list-style-type: none"> ■ use technical language fluently, draw appropriate conclusions and model aspects of their ideas when developing proposals. <p>d) demonstrate clear strategies for testing and evaluating by taking into account the working characteristics of materials and components; the product's impact on society; and the precise requirements of the brief and/or specification:</p> <ul style="list-style-type: none"> ■ confidently analyse ideas and outcomes and draw highly appropriate conclusions, enhancing interpretation by others. 	<p>quality products that match the specification;</p> <p>b) plan, demonstrating an awareness of industrial methods and approaches during designing and making activities:</p> <ul style="list-style-type: none"> ■ select an appropriate range of tools and equipment and plan processes; ■ manage time by anticipating potential problems and responding to changing circumstances; ■ determine the degree of accuracy required for products to function as intended, and apply relevant external standards to their task; ■ test the performance of their product against specified criteria and act on their findings by modifying their proposals if appropriate; <p>c) communicate ideas and outcomes using ICT appropriately for communicating, modelling, data handling, controlling or manufacture:</p> <ul style="list-style-type: none"> ■ work to devised plans and seek agreement on realistic deadlines; ■ take account of the relationship between material, form and manufacturing processes. <p>d) demonstrate clear strategies for evaluating:</p> <ul style="list-style-type: none"> ■ analyse information critically and objectively; ■ assess the extent to which their work will meet
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		<p>genuine needs;</p> <ul style="list-style-type: none"> ■ devise quality assurance procedures and reviewing the way the work plan is followed using external sources for evaluating products.
E/U boundary performance descriptions	<p>Learners characteristically:</p> <p>a) demonstrate their ability to analyse questions and/or contexts and record some relevant information during in-depth study:</p> <ul style="list-style-type: none"> ■ take account of a limited range of factors; ■ take account of requirements and demonstrate some knowledge and understanding of manufacturing processes during product analysis; ■ develop a design brief and specification. <p>b) use technical language relevant to the task:</p> <ul style="list-style-type: none"> ■ clarify the task identifying user needs and carry out research during designing and making activities; ■ generate ideas based on their own knowledge and understanding, satisfying most of the specification criteria; ■ show awareness of manufacturing processes; 	<p>Learners characteristically:</p> <p>a) demonstrate a basic understanding of systems and control and/or products and applications during in-depth study;</p> <p>b) demonstrate some understanding of a limited range of materials, ingredients, components and production processes;</p> <p>c) work safely with materials, ingredients and components to create a product that meets their specification;</p> <p>d) plan, demonstrating some awareness of industrial methods, during making activities;</p> <p>e) select some appropriate tools and resources;</p> <p>f) carry out at least one test of their product;</p> <p>g) work to an outline plan;</p>

	<ul style="list-style-type: none">■ develop their proposals and model at least one aspect;■ indicate at least one working characteristic of a material or component;■ demonstrate some strategies for testing and evaluating that refer to products and the need for modifications;■ evaluate ideas and outcomes in an appropriate way, including ICT, and draw conclusions enabling others to understand them.	<ul style="list-style-type: none">h) use ICT appropriately for communicating, modelling, data handling, controlling or manufacture;i) demonstrate strategies for testing and evaluating:<ul style="list-style-type: none">■ analyse information;■ assess the extent to which the product meets its specification.
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