



Syllabus

Cambridge O Level Design & Technology 6043

For examination in November 2020, 2021 and 2022.



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'We think the Cambridge curriculum is superb preparation for university.'

Christoph Guttentag, Dean of Undergraduate Admissions, Duke University, USA



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Changes to this syllabus

For information about changes to this syllabus for 2020, 2021 and 2022, go to page 26.

This is syllabus version 2, published April 2022.

Any textbooks endorsed to support IGCSE Design & Technology (0445) for examination from 2015 are suitable for use with this syllabus.



1 Why choose this syllabus?

Key benefits

Cambridge O Level syllabuses are created especially for international students. For over 25 years, we have worked with schools and teachers worldwide to develop syllabuses that are suitable for different countries, different types of schools and for learners with a wide range of abilities. These qualifications are designed for students whose first language may or may not be English and this is acknowledged throughout the examination process.

Cambridge O Level Design & Technology enables learners to identify, consider and solve problems through creative thinking, planning and design, and by working with different media, materials and tools to produce a made product.

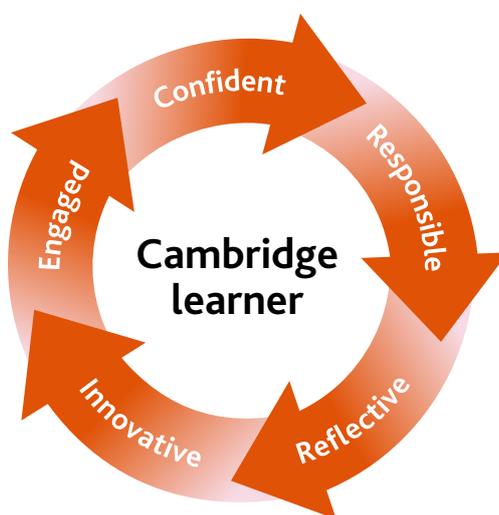
Learners gain technical and design awareness and develop skills such as initiative, resourcefulness, enquiry and ingenuity. They also develop the communication skills central to the design process.

Cambridge O Level Design & Technology provides an ideal basis for further study and equips learners with technical knowledge and practical designing and making skills for the world of work.

The syllabus is designed to accommodate a range of interests, materials and resources, and allows the different skills of the teaching staff to be fully exploited.

Our programmes balance a thorough knowledge and understanding of a subject and help to develop the skills learners need for their next steps in education or employment.

Our approach encourages learners to be:



'Cambridge O Level has helped me develop thinking and analytical skills which will go a long way in helping me with advanced studies.'

Kamal Khan Virk, former student at Beaconhouse Garden Town Secondary School, Pakistan, who went on to study Actuarial Science at the London School of Economics

Recognition and progression

The combination of knowledge and skills in Cambridge O Level Design & Technology gives learners a solid foundation for further study. Candidates who achieve grades A* to C are well prepared to follow a wide range of courses including Cambridge International AS & A Level Design & Technology.

Cambridge O Levels are accepted and valued by leading universities and employers around the world as evidence of academic achievement. Many universities require a combination of Cambridge International AS & A Levels and Cambridge O Levels or equivalent to meet their entry requirements.

Learn more at www.cambridgeinternational.org/recognition

Supporting teachers

We provide a wide range of practical resources, detailed guidance and innovative training and professional development so that you can give your learners the best possible preparation for Cambridge O Level.



2 Syllabus overview

Aims

The aims describe the purposes of a course based on this syllabus.

The aims are to enable students to:

- develop creative thinking in areas relevant to design and technology
- apply problem-solving skills to practical and technological problems
- develop the communication skills central to design, realisation and evaluation
- gain knowledge and understanding of design and technology
- develop skills in research and investigation
- design and make products, taking into consideration sustainability and the wider impact on society
- develop the ability to make aesthetic, economic, ethical and technical value judgements.

Content overview

Common content

| | | | | | | | |
|------------------------------|--|----------------------------------|---|--------------------------------------|------------------------------------|--------------------------------------|---------|
| Observe need/ requirement | Design brief/ specification | Identification/ research | Generation of possible ideas | Selection/ organisation | Evaluation | Implementation and realisation | |
| Health and safety | Initiation and development of ideas, and recording data | Communication of design ideas | Use of technology in design and making | Design & technology in society | Practical design application | Environment and sustainability | Control |

Resistant Materials content

| | | | | | |
|----------------------|-----------------------------|---|---------|-------------------------|-----------|
| Types of material | Preparation of materials | Setting, measuring, marking out, testing | Shaping | Joining and assembly | Finishing |
|----------------------|-----------------------------|---|---------|-------------------------|-----------|



Support for Cambridge O Level Design & Technology

Our School Support Hub www.cambridgeinternational.org/support provides Cambridge schools with a secure site for downloading specimen and past question papers, mark schemes, grade thresholds and other curriculum resources specific to this syllabus. The School Support Hub community offers teachers the opportunity to connect with each other and to ask questions related to the syllabus.

This O Level syllabus shares content with IGCSE Design & Technology (0445). For further support see the Teacher Support site page for IGCSE Design & Technology (0445). You will find additional resources which are useful and relevant to O Level Design & Technology (6043) teachers such as past papers, Example Candidate Responses and Teacher forums. Textbooks for the IGCSE should also be equally useful for the O Level course.

Assessment overview

All candidates take three components: Paper 1 Product Design, Component 2 Design Project and Paper 3 Technology: Resistant Materials.

All candidates take:

Paper 1 1 hour 15 minutes
 Product Design 25%
 50 marks
 The question will be based on the Common content: Product Design
 Answer **one** question
 Written/drawing paper
 Externally assessed

and:

Paper 3 1 hour
 Technology: Resistant Materials 25%
 50 marks
 Questions will be based on the Specialist option: Resistant Materials content and the Common content: Product Design
 Section A: answer **all** questions
 Section B: answer **one** question
 Written paper
 Externally assessed

and:

Component 2
 Design Project 50%
 100 marks
 School-based assessment
 Internally assessed and externally moderated

Assessment objectives

The assessment objectives (AOs) are:

AO1 Knowledge and understanding

Recall, select and communicate knowledge and demonstrate understanding in design & technology, including its wider effects.

AO2 Application

Apply knowledge, understanding and skills in a variety of contexts and in designing and making products.

AO3 Analysis and evaluation

Analyse and evaluate products, including their design and production.

Weighting for assessment objectives

The approximate weightings allocated to each of the assessment objectives (AOs) are summarised below.

Assessment objectives as a percentage of the qualification

| Assessment objective | Weighting in O Level % |
|---------------------------------|------------------------|
| AO1 Knowledge and understanding | 30 |
| AO2 Application | 50 |
| AO3 Analysis and evaluation | 20 |

Assessment objectives as a percentage of each component

| Assessment objective | Weighting in components % | | |
|---------------------------------|---------------------------|-------------|---------|
| | Paper 1 | Component 2 | Paper 3 |
| AO1 Knowledge and understanding | 20 | 20 | 60 |
| AO2 Application | 60 | 60 | 20 |
| AO3 Analysis and evaluation | 20 | 20 | 20 |

3 Subject content

All candidates must study the Design & Technology Common content below. This Common content provides foundation knowledge and skills for design & technology which are important to all areas of the subject. You may wish to integrate this content with the Resistant Materials content throughout your teaching.

Teachers and candidates are encouraged to use CAD/CAM (computer-aided design / computer-aided manufacturing) throughout the curriculum if they have access to the facilities.

1 Common content: Product Design

Candidates should be able to:

Observe need/requirement

- identify and describe needs and opportunities for design and technological improvements

Design brief/specification

- analyse and produce design specifications for problems which they, or others, have identified

Identification/research

- identify the constraints imposed by knowledge, resource availability and/or external sources which may influence proposed solutions
- gather, order and assess information relevant to the solution of practical/technological problems
- produce and/or interpret data (e.g. diagrams, flow charts, graphs, experimental and test results)

Generation of possible ideas

- generate and record ideas as potential solutions to problems using a range of techniques
- identify what resources they need for solving practical/technological problems
- use a variety of media and equipment to produce models and mock-ups as a means of exploring a problem and as a means of testing the feasibility of a solution
- recognise the need for continuous appraisal of their own progress, thinking and decision-making, in order to provide themselves with opportunities for review
- relate self-appraisal judgements to the purpose of their study, in particular the specification which they set themselves

Selection/organisation

- select and develop a solution after consideration of time, cost, skill and resources
- organise and plan in detail the production of the selected solution

1 Common content: Product Design *continued*

Evaluation

- evaluate existing products/systems, the work of others and their own work
- test the performance of the product/solution against the original specification
- use different methods and sources to assess the effectiveness of a product (e.g. sampling, questionnaires, interviews)
- suggest any possible modification and improvements (consideration to include functional, safety, aesthetic, ergonomic and economic factors)

Implementation and realisation

- show an awareness of correct procedures for the preparation of materials
- show an awareness of the correct and accurate methods of drawing, marking out and testing
- select appropriate processes for shaping, forming, cutting, joining, fitting, assembling and finishing a variety of materials

Health and safety

- show an awareness of the correct use of hand and machine tools and equipment
- understand the need to take all mandatory and necessary safety precautions when using a variety of tools, machines, materials and other resources
- understand the responsibilities of designers to ensure that products are safe to use
- understand the importance of personal safety and the safety of others when designing and making products
- recognise basic safety symbols used in the workshop

Initiation and development of ideas, and recording of data

- extract relevant information from sources, and interpret and record information and data

Communication of design ideas

- use technical vocabulary, number skills, colour, shading and other media to produce sketches, models, diagrams, drawings and written materials, which communicate their ideas with precision and clarity

Use of technology in design and making

- research existing products (for example by using the internet)
- understand the benefits of CAD/CAM when designing and manufacturing one-off or batch production
- understand how CAD can be used to generate 2D and 3D images
- understand how CAD/CAM is used in industry
- be aware of a variety of machines that can be controlled by computer, including CNC machines: miller/router/engraver, lathe, laser cutter
- have an awareness and understanding of how computers can enhance stock control and quality control

1 Common content: Product Design *continued*

Design & technology in society

- show awareness of the effect of design & technology activity on social, environmental and economic issues
- demonstrate awareness of the role of designers, artisans and technologists in industry and society
- take a range of human needs into account

Practical design application

- consider how existing products meet the needs of the users
- consider production manufacturing as: one-off, batch and mass production
- generate design proposals:
 - identify the resources needed
 - plan the stages of manufacture
 - evaluate proposals against a specification
 - understand the relevance of function and aesthetics (in terms of the appreciation of the use of line, shape, form, proportion, space, colour and texture) as appropriate to their designed solutions and the work of others
 - understand the importance of anthropometrics and ergonomics
 - use modelling to test proposals

Environment and sustainability

- recognise that different forms of energy sources exist, namely, fossil fuels, nuclear, renewable
- understand the difference between the finite and almost infinite nature of energy sources and how design can help to conserve all energy sources
- use energy sources effectively and efficiently
- be aware of the responsibilities of designers towards sustainability of materials and other resources
- select materials based on environmental and sustainable considerations
- understand the need for recycling
- identify materials that can be recycled and those that cannot, including the use of recycling symbols on products
- understand the importance of disassembly of products and the reuse of parts
- understand that products may be designed with a limited lifetime

Control

- identify the features of a control system in terms of input devices, processing elements, output devices, feedback

2 Common content: Preparing your candidates for the project

This guidance shows what you should encourage all candidates to do when they work on Component 2 Design Project. The project involves the Common content. Candidates may use knowledge and skills gained in the Resistant Materials component.

Candidates should be able to:

Identification of a need or opportunity with a brief analysis leading to a design brief

- explore several possible design needs or design opportunities
- identify and explore the needs of intended user/s
- develop one potential design need/opportunity
- present a full and clear design brief

Research into the design brief resulting in a specification

- complete research into aspects of the design brief
- consider needs of user/s
- analyse data/information generated
- produce a detailed and justified specification

Generation and exploration of design ideas

- identify and sketch a wide range of imaginative solutions which are conceptually different
- develop and clarify each solution with reference to the specification, using annotations
- explore technical aspects of each idea/part idea, e.g. possible materials and constructions
- evaluate ideas/part ideas regarding each specification point

Development of proposed solution

- clarify main features/aspects of proposed solution
- use modelling and trialling where appropriate to test aspects of the proposed solution
- specify details of form, materials and construction/production methods
- evaluate the proposed solutions regarding the specification points

Planning for production

- produce high-quality working drawings which include full details for manufacture
- produce a production plan which includes the stages of manufacture
- specify fittings and finishes, and provide a material list

Product realisation

- produce a product which demonstrates an ability to manipulate materials sensitively and use technologies successfully
- complete and finish the product to a high standard

2 Common content: Preparing your candidates for the project *continued*

Testing and evaluation

- test the product (in the intended environment, where possible)
- make justified comments about the performance of the product regarding the expectation of the specification points
- identify strengths and weaknesses of the product
- evaluate the project overall, making concluding comments about the successes and limitations of the product
- identify proposals for further development of the product

Freehand or computer-generated sketches, drawings or illustrations should be clear and well presented.

3 Resistant Materials content

Resistant Materials aims to develop the skills which designers use within the context of materials and their processing. Candidates need sufficient practical experience so they can get a broad understanding of materials, processes and technology, in order to become competent in using resistant materials.

This practical experience should include:

- the general physical and working properties of common construction materials (plastics, woods and metals) in relation to specific designing and making tasks
- simple comparative testing leading to the reasoned selection of materials and processes for specific design and making tasks.

It is a good idea to teach the following content in a practical way, wherever possible, and to integrate it with the Common content.

Candidates should be able to:

Types of material

- understand the physical and working properties of plastics, woods and metals and their applications

Smart and modern materials

- develop an awareness and understanding of 'smart' and modern materials, including: thermochromic materials; polymorph; shape memory alloy (SMA); shape memory polymer (acrylic)

Plastics

- show a working knowledge of the following:
 - thermoplastics (nylon, low and high density polyethylene [LDPE and HDPE], polyethylene terephthalate [PET], polyvinyl chloride [PVC], acrylic [PMMA], polystyrene [PS], polypropylene [PP], acrylonitrile-butadiene-styrene [ABS])
 - thermosetting plastics (polyester resin including GRP, melamine formaldehyde [MF], urea formaldehyde [UF], phenol formaldehyde [PF] and epoxy resin)

Woods

- demonstrate a working knowledge of natural timbers and understand their classification, properties and uses
- understand why timber is seasoned and how to care for timber during storage and construction
- understand steaming and bending of timbers and have knowledge of adhesives' curing times and strengths
- demonstrate a working knowledge of the following manufactured boards: plywood, blockboard, chipboard, hardboard and MDF
- understand the advantages and disadvantages of working with manufactured boards compared with solid wood

3 Specialist option: Resistant Materials *continued*

Metals

- demonstrate a working knowledge of the following metals:
 - ferrous metals (cast iron, mild steel, stainless steel, high speed steel [HSS] and carbon steels)
 - non-ferrous metals (aluminium, duralumin and other common casting alloys, copper and its alloys, zinc, lead and tin)
- understand how the following processes can change the molecular structure of a material making it more or less suitable for the task it has to perform:
 - work hardening
 - annealing all metals
 - case hardening of mild steel
 - hardening and tempering tool steel (HCS)

Composites

- show an understanding of the term *composite* and be aware of the practical applications for each of the following composite materials:
 - Kevlar®
 - carbon fibre reinforced plastic (CFRP)
 - glass reinforced plastic (GRP)

Preparation of materials

- show knowledge of available market forms, types and sizes
- understand methods of cutting by use of hacksaw, guillotine, tenon saw, cross-cut saw, panel saw and portable power tools
- understand the use of datum surfaces/lines/edges and be able to produce them by planing or filing
- explain the preparation for machine processes and safe methods of securing materials to work surfaces, work tables, faceplates, lathe chucks and between centres on a lathe

Setting, measuring, marking out, testing

- measure and/or mark out using rule, pencil, marking knife, marker pen, scriber, try square, bevel, mitre square, centre square, dot/centre punch, dividers, inside/outside/odd-leg calipers, template, marking/cutting/mortise gauge
- produce datum lines by surface plate and scribing block or calipers
- measure using a micrometer, vernier gauge and/or digital caliper

3 Specialist option: Resistant Materials *continued*

Shaping

- (a) Deforming/reforming
- understand the following processes: bending, sand casting, die casting, lamination, vacuum forming, blow moulding, injection moulding, extrusion, press forming
- (b) Wastage/addition
- select and perform the following forms of cutting and removal of material, and joining and adding to a material to produce the required shape, form or contour:
 - use hand snips, saws, files, basic planes and abrasive cutters
 - simple hole boring by hand or machine including pilot, clearance, tapping, countersunk and counterbored holes
 - use taps and dies for screw cutting by hand
 - use planes, chisels, gouges and rasps
 - use abrasive mops, discs and belts
 - use a centre lathe and wood turning lathe
 - use portable power tools

Joining and assembly

- use various methods of fabrication and fitting to join parts of products, permanently or temporarily
- understand the processes of soldering, brazing, welding, riveting/pop riveting
- understand methods of carcass, stool and frame construction using permanent and temporary joints
- use holding devices, formers and jigs (for sawing, drilling and bending) to assist joining and assembly
- understand the use of knock-down (KD) fittings for use with manufactured boards such as chipboard, including one-piece and two-piece corner blocks, scan fittings, cam lock and leg fastenings
- understand where to use a wide range of pre-manufactured components, including screws, nails, nuts, bolts, hinges and catches
- understand how sizes of screws, nails, nuts and bolts are specified
- be aware of a range of different adhesives to join a variety of materials and any special considerations related to preparation, application, drying times and health and safety

Finishing

- understand the preparation for and application of surface treatments
- be aware of a range of different finishes including oils, paints, lacquers, stains, satin polishes, dipcoating
- be aware of surface finishes available for both interior and exterior use
- be aware of the special finishes available that will prevent corrosion or stains, or withstand heat or liquids
- understand the term *self-finishing* and the processes by which some materials are self-finished
- understand the process of electroplating and anodising

4 Details of the assessment

Candidates take three components: Paper 1 Product Design, Component 2 Design Project and Paper 3 Technology: Resistant Materials.

All components assess the Common content for Design & Technology. Paper 3 also assesses the Resistant Materials content.

Paper 1 Product Design

Written/drawing paper, externally assessed, 1 hour 15 minutes, 50 marks

Paper 1 tests the Common content: Product Design. However, candidates also need to make use of their knowledge of the Resistant Materials content they have studied.

Candidates answer one compulsory question which assesses their design understanding and abilities.

Candidates answer Paper 1 on pre-printed A3 insert sheets which set out specific space for each part of the question.

Candidates may use a calculator in the examination.

Standard drawing equipment

All candidates taking this paper should have access to the following basic drawing equipment in the examination:

- A3 drawing board and tee square (or parallel drafting device)
- 30°/60° and 45° set squares
- 180° protractor
- pencil compass
- 300 mm rule
- drafting pencils
- coloured pencils
- eraser.

Component 2 Design Project

School-based assessment, internally assessed, externally moderated, 100 marks

Component 2 Design Project forms a significant part of the teaching and assessment requirements of this syllabus. Candidates usually work on their project over the final two terms of the course.

Guidance on preparing your candidates for their project is given in section 3 Subject content, under part 2 Common content: preparing your candidates for the project.

You must mark your candidates' project work and submit all marks and a sample of the marked folders for moderation. The mark scheme is given in 'Project assessment for Component 2 Design Project' at the end of this section.

Each candidate must complete an individual project. Candidates should produce a folder of work and a made product. The made product itself is **not** to be submitted. All relevant work should be presented in hard copy as an A3-size folder.

The project area is decided by the candidate with advice, as appropriate, from you as their teacher. Cambridge International does not prescribe or recommend project areas. The project could make use of the candidate's Resistant Materials study; this approach will allow candidates to further their experience, knowledge and skills in this area. The open nature of design & technology means that a candidate might want to pursue a focus which will involve knowledge, materials and skills from other areas of design and technology.

Candidates are encouraged to make full use of the wide range of ICT available in schools for design work. Freehand sketches and hand drawn technical drawings and computer-aided design (CAD) generated drawings are acceptable in the A3 submission folder.

It is important that candidates have the opportunity to access the facilities needed to realise their products. Although many schools will have access to traditional workshop facilities, ICT has increasingly developed to bring computer-aided manufacturing (CAM) into the school workshop. Candidates are encouraged to make full use of this type of equipment, where available, which may include laser cutters, 3-dimensional (3D) printers, and other computer controlled machines and programs. It is important to balance ICT controlled production with hand crafting techniques so that candidates gain experience across all methods of production.

Models are not appropriate as made products in Resistant Materials. For example, it is inappropriate to produce paper/card models as the final outcome for products that should be manufactured using resistant materials. Candidates must create a product that can be properly tested and evaluated in the environment it is intended for.

All folders must include sufficient photographs of the made product, showing an overall view together with detailed views of evidence which support the award of marks for project assessment criterion 6 'Product realisation'.

Further guidance for teachers on this component is available in the *Coursework Handbook* for this syllabus, and in our online Coursework Training Programme. Please see our School Support Hub at www.cambridgeinternational.org/support

Authenticity

It is the centre's responsibility to make sure all coursework is the candidate's original work. Candidates should provide references to any source materials used, listing these at the end of the project folder.

A general discussion on the progress of coursework is a natural part of the teacher/candidate relationship, as it is for other parts of the course. In addition, if plans and first drafts are completed under teacher supervision, you can be assured of the authenticity of the final coursework.

You should not mark, correct or edit draft coursework; candidates can certainly draft and redraft work, but you should only give brief summative comment on progress during this phase.

Paper 3 Technology: Resistant Materials

Written paper, externally assessed, 1 hour, 50 marks

Paper 3 assesses the Resistant Materials content as well as the Common content: Product Design.

Section A contains 10 compulsory questions, worth 25 marks. In Section B candidates choose **one** out of three questions, each worth 25 marks. Resistant Materials content and Common content may be assessed in either section of the examination paper.

Candidates may use a calculator in the examination.

Project assessment for Component 2 Design Project

Marking the project

Your marking of the project should be positive, rewarding achievement where possible but clearly differentiating across the whole range of marks available.

In approaching the assessment process, you should look at the work and then make a 'best fit' judgement as to which level statement it fits. In practice the work does not always match one level statement precisely so a judgement may need to be made between two or more level statements.

Once a 'best fit' level statement has been identified the following guide should be used to decide on a specific mark:

- Where the candidate's work **convincingly** meets the level statement, the highest mark should be awarded.
- Where the candidate's work **adequately** meets the level statement, the most appropriate mark in the middle of the range should be awarded.
- Where the candidate's work **just** meets the level statement, the lowest mark should be awarded.

Recording and submitting candidates' marks and folders

For information, dates and methods of submission of the coursework marks and sample, please refer to the samples database at www.cambridgeinternational.org/samples

Candidates' marks for Component 2 Design Project must be recorded on the Individual Candidate Record Card and the Coursework Assessment Summary Form produced by Cambridge International. The marks on these forms must be identical to the marks you submit.

The Individual Candidate Record Card and Coursework Assessment Summary Form, and the instructions for completing them, should be downloaded each year from the samples database at www.cambridgeinternational.org/samples

The database will ask you for the syllabus code (i.e. 6043) and your centre number, after which it will take you to the correct forms. Follow the instructions on the form itself when completing each form.

Project mark scheme

All three assessment objectives are tested in each of the seven marking criteria.

Criterion 1: Identification of a need or opportunity with an analysis leading to a design brief

| Level | Description | Marks |
|---------|--|-------|
| Level 3 | Comprehensive investigation and full analysis of the design need, the identification of the intended user/s and a clear and full design brief. | 4–5 |
| Level 2 | Relevant investigation with appropriate analysis of the design need, the identification of the intended user/s and a functional design brief. | 2–3 |
| Level 1 | Limited investigation with an attempt at some analysis of the design need which results in a simple and unqualified design brief. | 1 |
| Level 0 | No creditable response. | 0 |

Criterion 2: Research into the design brief resulting in a specification

| Level | Description | Marks |
|---------|---|-------|
| Level 3 | Full and objective research into the design brief and intended user/s with thorough analysis of the data/information leading to a detailed and justified specification for the product. | 7–10 |
| Level 2 | Relevant research into the design brief and intended user/s with appropriate analysis of the data/information leading to a clear and partly justified specification for the product. | 4–6 |
| Level 1 | Minimal examination and research into the design brief and intended user/s resulting in a limited specification for the product. | 1–3 |
| Level 0 | No creditable response. | 0 |

Criterion 3: Generation and exploration of design ideas

| Level | Description | Marks |
|---------|--|-------|
| Level 4 | A wide range of imaginative solutions which are conceptually different. Ideas are developed and clarified with reference to the specification. Appropriate drawing techniques are used and are clear and well presented. Detailed and concise annotations explore technical aspects of each idea including consideration of possible materials and constructions. Ideas are evaluated with clear reference to each specification point. | 16–20 |
| Level 3 | A range of imaginative solutions which are conceptually different. Main ideas are developed and clarified with reference to the specification. Appropriate drawing techniques used with annotations to explore most of the technical aspects including consideration of possible materials and constructions. Ideas are evaluated with some reference to the specification points. | 11–15 |
| Level 2 | A limited range of solutions. Some ideas are clarified with reference to the specification. Use of appropriate drawing techniques with limited annotations to explore some aspects of each idea. Main ideas are evaluated with some reference to the specification points. | 6–10 |
| Level 1 | A narrow range of ideas with a tendency to focus on one or two ideas with little or no reference to the specification. Basic sketching skills used. Little or no reference to the evaluation of ideas. | 1–5 |
| Level 0 | No creditable response. | 0 |

Criterion 4: Development of proposed solution

| Level | Description | Marks |
|---------|---|-------|
| Level 3 | <p>Comprehensive evidence of modelling and trialling to assist decisions about form, materials, fixings and construction/production methods.</p> <p>Excellent use of appropriate drawing methods which assist the clarification of the technical specification of the item to be manufactured.</p> <p>Evidence of evaluative comments or references to the specification where appropriate.</p> | 11–15 |
| Level 2 | <p>Adequate evidence of modelling and trialling or sketches with annotations to assist decisions about form, materials, fixings and construction/production methods.</p> <p>Good use of appropriate drawing methods which assist the clarification of the technical specification of the item to be manufactured.</p> <p>Evidence of some evaluative comments or references to the specification.</p> | 6–10 |
| Level 1 | <p>Some evidence of development towards a single solution.</p> <p>Superficial or limited information on decisions about form, materials, fixings and construction/production methods.</p> <p>Basic use of various drawing methods which assist the clarification of the technical specification of the item to be manufactured.</p> <p>Limited or no reference to the specification.</p> | 1–5 |
| Level 0 | No creditable response. | 0 |

Criterion 5: Planning for production

| Level | Description | Marks |
|---------|--|-------|
| Level 3 | <p>High-quality working drawings which include full details for manufacture.</p> <p>Clear and detailed evidence of production planning leading to a logical, clearly communicated, sequence of the stages of manufacture including material lists, fittings and finishes.</p> | 7–10 |
| Level 2 | <p>Working drawings which include most details for manufacture, e.g. overall layout and major dimensions.</p> <p>Adequate evidence of production planning leading to a logical sequence of the stages of manufacture including most of the details required for material lists, fittings and finishes.</p> | 4–6 |
| Level 1 | <p>Basic working drawings which may include some details for manufacture, e.g. overall layout and major dimensions.</p> <p>Limited evidence of production planning. Some of the details required for material lists, fittings and finishes.</p> | 1–3 |
| Level 0 | No creditable response. | 0 |

Criterion 6: Product realisation

| Level | Description | Marks |
|---------|--|-------|
| Level 6 | The product will be complete and finished to a very high standard. The overall outcome will be made with precision and accuracy, and will function well. The product will fully meet all the requirements of the specification. | 26–30 |
| Level 5 | The product will be complete and finished to a high standard. The overall outcome will be well made, and will function well, but may have some parts with minor inaccuracies and blemishes. The product will meet most of the requirements of the specification. | 21–25 |
| Level 4 | The product will be complete and finished to a good standard. The overall outcome will be well made, and will function well, but may contain some inaccuracies and blemishes. The product will meet many of the requirements of the specification. | 16–20 |
| Level 3 | The product will be mainly complete and finished to a fair standard. The overall outcome will be adequately made, and will partially function, but may contain significant inaccuracies and blemishes. The product will meet some of the requirements of the specification. | 11–15 |
| Level 2 | The product may not be complete. The overall outcome will be adequately made and will partially function, but may contain significant mistakes, inaccuracies and/or blemishes. The product will meet a few of the requirements of the specification. | 6–10 |
| Level 1 | The product will not be complete with parts at a poor level of finish. The overall outcome will be basic and it may not function as intended. The work will contain significant mistakes, inaccuracies and blemishes. The product will meet few or none of the requirements of the specification. | 1–5 |
| Level 0 | No creditable response. | 0 |

Criterion 7: Testing and evaluation

| Level | Description | Marks |
|---------|--|-------|
| Level 3 | Objective testing and evaluation of the product with systematic reference to its performance, the specification and user. Where appropriate, testing will be carried out in the environment for which the product was intended. Clear identification and analysis of strengths and weaknesses of the product leading to detailed and meaningful conclusions with proposals for further development. | 7–10 |
| Level 2 | Adequate testing and evaluation of the product with some reference to its performance, the specification and user. Identification of simple strengths and weaknesses of the product leading to some conclusions with proposals for further development. | 4–6 |
| Level 1 | Little or no evidence of the testing and evaluation of the product with general reference to its performance. Little or no reference to the specification and user. Superficial identification of a limited number of strengths and weaknesses of the product leading to limited proposals for further development. | 1–3 |
| Level 0 | No creditable response. | 0 |

Internal moderation for centres in Mauritius

If more than one teacher in your centre is marking internal assessments, you must make arrangements to moderate or standardise your teachers' marking so that all candidates are assessed to a common standard.

Moderators appointed by the Mauritius Examinations Syndicate (MES) will moderate all centre marking on behalf of Cambridge International.

- You must submit the marks of all candidates to MES.
- You must also submit the marked work of a sample of candidates to MES.

If more than one teacher has assessed the coursework, the sample should include examples of the marking of each teacher. The sample should also include the Individual Candidate Record Cards for the selected candidates. Internal moderation must have taken place to standardise marking in your centre. You should record the internally moderated marks for all candidates on the Coursework Assessment Summary Form and submit these marks to the MES.

The MES will then send a representative sample to Cambridge International, after in-country moderation. External moderators will produce a short report for each centre with feedback on your application of the mark scheme.

Internal moderation for all other centres

If more than one teacher in your centre is marking internal assessments, you must make arrangements to moderate or standardise your teachers' marking so that all candidates are assessed to a common standard. Further information on the process of internal moderation can be found on the samples database at www.cambridgeinternational.org/samples

The sample you submit to Cambridge International should include examples of the marking of each teacher. You should record the internally moderated marks for all candidates on the Coursework Assessment Summary Form and submit these marks to Cambridge International according to the instructions set out in the *Cambridge Handbook*.

Cambridge International will externally moderate all internally assessed components.

- You must submit the marks of all candidates to Cambridge International.
- You must also submit the marked work of a sample of candidates to Cambridge International. The samples database provides details of how the sample will be selected and how it should be submitted. The samples database can be accessed at www.cambridgeinternational.org/samples

External moderators will produce a short report for each centre with feedback on your application of the mark scheme and administration of the assessment.

Command words

The table below includes command words used in the assessment for this syllabus. The use of the command word will relate to the subject context.

| Command word | What it means |
|------------------|---|
| Analyse | examine in detail to show meaning, identify elements and the relationship between them |
| Calculate | work out from given facts, figures or information |
| Compare | identify/comment on similarities and/or differences |
| Contrast | identify/comment on differences |
| Define | give precise meaning |
| Describe | state the points of a topic / give characteristics and main features |
| Develop | take forward to a more advanced stage or build upon given information |
| Discuss | write about issue(s) or topic(s) in depth in a structured way |
| Evaluate | judge or calculate the quality, importance, amount, or value of something |
| Explain | set out purposes or reasons / make the relationships between things evident / provide why and/or how and support with relevant evidence |
| Give | produce an answer from a given source or recall/memory |
| Identify | name/select/recognise |
| Justify | support a case with evidence/argument |
| Outline | set out main points |
| Sketch | make a simple freehand drawing showing the key features, taking care over proportions |
| State | express in clear terms |
| Suggest | apply knowledge and understanding to situations where there are a range of valid responses in order to make proposals |

5 What else you need to know

This section is an overview of other information you need to know about this syllabus. It will help to share the administrative information with your exams officer so they know when you will need their support. Find more information about our administrative processes at www.cambridgeinternational.org/examsofficers

Before you start

Previous study

We do not expect learners starting this course to have previously studied design & technology.

Guided learning hours

We design Cambridge O Level syllabuses based on learners having about 130 guided learning hours for each subject during the course but this is for guidance only. The number of hours a learner needs to achieve the qualification may vary according to local practice and their previous experience of the subject.

Availability and timetables

You can enter candidates in the November exam series. You can view the timetable for your administrative zone at www.cambridgeinternational.org/timetables

Cambridge O Levels are available to centres in Administrative Zones 3, 4 and 5. Centres in Administrative Zones 1, 2 or 6 wishing to enter candidates for Cambridge O Level examinations should contact Cambridge International Customer Services.

All Cambridge schools are allocated to one of six administrative zones. Each zone has a specific timetable. This syllabus is **not** available in all administrative zones. To find out about the availability visit the syllabus page at www.cambridgeinternational.org/olevel

Private candidates cannot enter for this syllabus.

Combining with other syllabuses

Candidates can take this syllabus alongside other Cambridge International syllabuses in a single exam series. The only exceptions are:

- Cambridge IGCSE® Design & Technology (0445)
- Cambridge O Level CDT: Design & Communication (7048)
- Cambridge IGCSE (9–1) Design & Technology (0979)
- syllabuses with the same title at the same level.

Cambridge O Level, Cambridge IGCSE and Cambridge IGCSE (9–1) syllabuses are at the same level.

Making entries

Exams officers are responsible for submitting entries to Cambridge International. We encourage them to work closely with you to make sure they enter the right number of candidates for the right combination of syllabus components. Entry option codes and instructions for submitting entries are in the *Cambridge Guide to Making Entries*. Your exams officer has a copy of this guide.

Exam administration

To keep our exams secure, we produce question papers for different areas of the world, known as 'administrative zones'. We allocate all Cambridge schools to one administrative zone determined by their location. Each zone has a specific timetable. Some of our syllabuses offer candidates different assessment options. An entry option code is used to identify the components the candidate will take relevant to the administrative zone and the available assessment options.

Support for exams officers

We know how important exams officers are to the successful running of exams. We provide them with the support they need to make your entries on time. Your exams officer will find this support, and guidance for all other phases of the Cambridge Exams Cycle, at www.cambridgeinternational.org/examsOfficers

Retakes

Candidates can retake the whole qualification as many times as they want to. This is a linear qualification so candidates cannot re-sit individual components.

Resubmitting coursework and carrying forward internally assessed marks

Information on resubmitting coursework and carrying forward internally assessed marks can be found in the *Cambridge Handbook* at www.cambridgeinternational.org/examsOfficers

Equality and inclusion

We have taken great care to avoid bias of any kind in the preparation of this syllabus and related assessment materials. In compliance with the UK Equality Act (2010) we have designed this qualification to avoid any direct and indirect discrimination.

The standard assessment arrangements may present unnecessary barriers for candidates with disabilities or learning difficulties. We can put arrangements in place for these candidates to enable them to access the assessments and receive recognition of their attainment. We do not agree access arrangements if they give candidates an unfair advantage over others or if they compromise the standards being assessed.

Candidates who cannot access the assessment of any component may be able to receive an award based on the parts of the assessment they have completed.

Information on access arrangements is in the *Cambridge Handbook* at www.cambridgeinternational.org/examsOfficers

Language

This syllabus and the related assessment materials are available in English only.

After the exam

Grading and reporting

Grades A*, A, B, C, D or E indicate the standard a candidate achieved at Cambridge O Level.

A* is the highest and E is the lowest. 'Ungraded' means that the candidate's performance did not meet the standard required for grade E. 'Ungraded' is reported on the statement of results but not on the certificate. In specific circumstances your candidates may see one of the following letters on their statement of results:

- Q (result pending)
- X (no result)
- Y (to be issued)

These letters do not appear on the certificate.

How students and teachers can use the grades

Assessment at Cambridge O Level has two purposes.

- To measure learning and achievement.
The assessment:
 - confirms achievement and performance in relation to the knowledge, understanding and skills specified in the syllabus, to the levels described in the grade descriptions.
- To show likely future success.
The outcomes:
 - help predict which students are well prepared for a particular course or career and/or which students are more likely to be successful
 - help students choose the most suitable course or career.

Grade descriptions

Grade descriptions are provided to give an indication of the standards of achievement candidates awarded particular grades are likely to show. Weakness in one aspect of the examination may be balanced by a better performance in some other aspect.

Grade descriptions for Cambridge O Level Design & Technology will be published after the first assessment of the O Level in 2020. Find more information at www.cambridgeinternational.org/olevel

Changes to this syllabus for 2020, 2021 and 2022

This is version 2 of the syllabus, published April 2022.

Changes to version 2 of the syllabus, published April 2022

| | |
|---|--|
| Changes to assessment (including changes to specimen papers) | <ul style="list-style-type: none"> Project mark scheme Criterion 5 has been updated. The marks awarded for Level 1 are now 1–3. Please see page 19 for details. |
| Other changes | <ul style="list-style-type: none"> The Individual Candidate Record Card (ICRC) has been updated to give more guidance to teachers on the type of comments to write. It gives examples of teacher comments to support the marks awarded. The ICRC should be downloaded from www.cambridgeinternational.org/samples |

Changes to version 1 of the syllabus, published September 2017

| | |
|--|---|
| Changes to the syllabus combination rules | <ul style="list-style-type: none"> Arrangements for combining syllabuses Candidates are no longer able to combine O Level Design & Technology (6043) with either O Level CDT: Design & Communication (7048) or with IGCSE Design & Technology (0445) in the same examination series. |
| Changes to syllabus availability | <ul style="list-style-type: none"> Changes to availability in administrative zones All Cambridge schools are allocated to one of six administrative zones. Each zone has a specific timetable. From 2020 this syllabus is not available in all these administrative zones. To find out the availability visit the syllabus page at www.cambridgeinternational.org.uk/olevel |
| Changes to syllabus information | <ul style="list-style-type: none"> Changes to coursework forms All candidates need to submit an Individual Candidate Record Card (ICRC) with their coursework for Component 2 Design Project. The ICRC should be downloaded from www.cambridgeinternational.org/samples Changes to remove advice on materials specialism It is no longer recommended that students specialise in one material (e.g. wood/metal/plastics) but this is still permitted. |
| Changes to assessment | <ul style="list-style-type: none"> Changes to AOs and aims The current seven assessment objectives (AOs) have been replaced with three AOs to support reliable assessment. Changes to scheme of assessment A new written paper, Paper 1 Product design is being introduced (duration: 1 hour 15 minutes; weighting 25% of the qualification). This will help to prepare students for the design industry. There is one compulsory question with seven parts. Paper 1 Technology is being replaced with another written paper, Paper 3 Technology: Resistant Materials (duration: 1 hour; weighting 25% of the qualification). Students answer all 10 questions in Section A, and one of three questions in Section B. |

continued

Changes to assessment (continued)

For both Paper 1 and Paper 3, candidates will answer on the question paper rather than in a separate answer booklet.

The Component 2 Design Project will no longer have a set theme each year, so teachers can choose whether to set a theme for students, or to allow a free choice theme. The Component 2 marking criteria have been clarified and reformatted.

The level of the assessment remains unchanged.

Changes to syllabus content

- Summary of changes to syllabus content

The syllabus content has been revised and refreshed and is now set out as distinct learning objectives, and there is no division into Core and Expansion, as in section 2.3 of the previous syllabus.

A small number of new topic areas have been added, as listed below, and the wording of other topics has been clarified.

New topics in Common content: Product Design

- The use of computer technology in designing and making (note: *actual use of CAD/CAM in teaching or for the assessed project will **not** be required*)
- Control (note: *covers the main features of a control system*)
- Environment and Sustainability
- Design & technology in society
- Health and safety.

New content for Paper 3 Technology: Resistant Materials

- Composites (note: *covers theoretical knowledge of 'composites' and their practical applications*)
- Plastics (note: *some additional types added*)
- Woods (note: *one additional bullet added*)
- Setting/measuring/marketing out/testing (note: *'measuring' and 'testing' added to heading and techniques/tools added*)
- Shaping (note: *additional techniques specified*)
- Joining and assembly (note: *expanded to clarify techniques covered*)
- Finishing (note: *two new bullet points added*)

The specimen materials have been revised to reflect the changes to the assessment and the syllabus content.

In addition to reading the syllabus, teachers should refer to the updated specimen assessment materials.

You are strongly advised to read the whole syllabus before planning your teaching programme.

Any textbooks endorsed to support IGCSE Design Technology (0445) for examination from 2015 are suitable for use with this syllabus.



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