

Our Subject Vision

Design and Technology is a subject which prepares pupils for work and life in the 21st century by allowing them to participate confidently and successfully in an increasingly technological world. Fast paced changes in the economy make predictions about future job market difficult. Giving students a range of transferable skills, up to date subject knowledge, and creative thinking will make them adaptable in the face of change.

Design and Technology can do this by empowering them to independently research, plan, implement and reflect and ensure they are equipped with the practical skills and technical knowledge to participate in modern society, giving them the option to pursue a career in STEM.

Design and technology programmes of study: key stage 3 National curriculum in England

Purpose of study

Design and technology are an inspiring, rigorous, and practical subject. Using creativity and imagination, pupils design and make products that solve real and relevant problems within a variety of contexts, considering their own and others' needs, wants and values. They acquire a broad range of subject knowledge and draw on disciplines such as mathematics, science, engineering, computing, and art. Pupils learn how to take risks, becoming resourceful, innovative, enterprising, and capable citizens. Through the evaluation of past and present design and technology, they develop a critical understanding of its impact on daily life and the wider world. High-quality design and technology education makes an essential contribution to the creativity, culture, wealth, and well-being of the nation.

Aims

The national curriculum for design and technology aims to ensure that all pupils:

- develop the creative, technical, and practical expertise needed to perform everyday tasks confidently and to participate successfully in an increasingly technological world
- build and apply a repertoire of knowledge, understanding and skills to design and make high-quality prototypes and products for a wide range of users
- critique, evaluate and test their ideas and products and the work of others

Attainment targets

By the end of key stage 3, pupils are expected to know, apply, and understand the matters, skills and processes specified in the programme of study. Schools are not required by law to teach the example content in [square brackets].

Subject content Key stage 3

Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making. They should work in a range of domestic and local contexts [for example, the home, health, leisure, and culture], and industrial contexts [for example, engineering, manufacturing, construction, energy].

When designing and making, pupils should be taught to:

Design

- use research and exploration, such as the study of diverse cultures, to identify and understand user needs
- identify and solve their own design problems and understand how to reformulate problems given to them
- develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations
- use a variety of approaches [for example, biomimicry and user-centred design], to generate creative ideas and avoid stereotypical responses
- develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools

Make

- select from and use specialist tools, techniques, processes, equipment, and machinery precisely, including computer-aided manufacture
- select from and use a wider, more complex range of materials and components, taking into account their properties

Evaluate

- analyse the work of past and present professionals and others to develop and broaden their understanding
- investigate new and emerging technologies
- test, evaluate and refine their ideas and products against a specification, taking into account the views of intended users and other interested groups
- understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers, and technologists

Technical knowledge

- understand and use the properties of materials and the performance of structural elements to achieve functioning solutions
- understand how more advanced mechanical systems used in their products enable changes in movement and force
- understand how more advanced electrical and electronic systems can be powered and used in their products [for example, circuits with heat, light, sound and movement as inputs and outputs]

- apply computing and use electronics to embed intelligence in products that respond to inputs [for example, sensors], and control outputs [for example, actuators], using programmable components [for example, microcontrollers]

End Points – GCSE DT

EP1. To innovate and take risks, to be resourceful, to be an enterprising and capable citizen.

EP2. To be a participant in advances in manufacturing, to be able to utilise CAD (Computer Aided Design) CAM.

EP3. To be able to conduct primary and secondary research relating to aesthetic, technical, cultural, social, economic, industrial, and environmental issues. To understand and apply findings to inform design decisions.

EP4. To design products that solve real world and relevant problems within a variety of contexts, considering their own and other's needs, wants and values

EP5. To combine practical and technological skills with creative thinking and problem solving to make products and systems to meet human needs

EP6. To have and apply an understanding of a wide range of materials, being able to choose and justify their use in relation to their aesthetic, technical, economic, cultural, and physical properties.

End Points – OCR National Engineering Design

R038: Principles of engineering design - EP1 - Designing processes, EP2 - Designing requirements, EP3 - Communicating design outcomes, EP4 - Evaluating design ideas

R039: Communicating designs - EP5 - Manual production of freehand sketches, EP6 - Manual production of engineering drawings, EP7 - Use of Computer Aided Design (CAD)

R040: Design, evaluation, and modelling - EP8 - Product evaluation, EP9 - Modelling design ideas

Subject Domains of Knowledge – GCSE DT

- D1. Industry and enterprise
- D2. Critical evaluation and disruptive technologies
- D3. Investigation with primary and secondary data
- D4. Prototype development
- D5. Specialist tools and equipment
- D6. Materials and their properties

Subject Domains of Knowledge – OCR National Engineering Design

R038: Principles of engineering design -

EP1 - Designing processes

- The stages involved in design strategies
- Stages of the iterative design process, and the activities carried out within each stage of this cyclic approach

EP2 - Designing requirements

- Types of criteria included in an engineering design specification
- How manufacturing considerations affect design
- Influences on engineering product design

EP3 - communicating design outcomes

- Types of drawing used in engineering
- Working drawings

Subject Key Concepts GCSE DT

Industry and enterprise

- C1. Organisation of the workplace
- C2. Business models
- C3. Automation
- C4. Scale of production

Critical evaluation and disruptive technologies

- C5. Global warming
- C6. Finite/non-finite
- C7. CAD/CAM
- C8. Planned obsolescence
- C9. Ethical considerations

Investigation with primary and secondary data

- C10. Primary and secondary data
- C11. Representation of data
- C12. Responding to data
- C.13 The work of others

Prototype development

- C.14 Design strategies
- C.15 Exploring design ideas
- C.16 Communicating design ideas

Specialist tools and equipment

Subject Key Concepts OCR National Engineering Design

R038: Principles of engineering design

EP1 - Designing processes

Linear design, Iterative design, Inclusive design, User-centred design, Sustainable design, Ergonomic design, Analysis of the design brief, Methods of researching the product requirements,

Production of an engineering design specification, Generation of design ideas by sketching and modelling, The reasons for the use of modelling, Virtual modelling of the design idea, Physical modelling of the design idea, **Manufacture**, or modification of the prototype

EP2 - Designing requirements

Needs and wants, Quantitative and qualitative criteria, Reasons for the product criteria included in the design specification (ACCESS FM), Scale of manufacture, Material availability and form, Types of manufacturing processes, Production costs, Market pull and technology push, British and International Standards, Legislation, Planned obsolescence, Sustainable design (6Rs), Design for the circular economy

EP3 - Communicating design outcomes

Freehand sketching, Isometric, Oblique, Orthographic drawings, Exploded views, Assembly drawings, Block diagrams,

<ul style="list-style-type: none"> Using CAD drawing software <p>EP4 - Evaluating design ideas</p> <ul style="list-style-type: none"> Methods of evaluating design ideas Modelling methods Methods of evaluating a design outcome <p>R039: Communicating designs -</p> <p>EP5 - Manual production of freehand sketches</p> <ul style="list-style-type: none"> Sketches for a design idea <p>EP6 - Manual production of engineering drawings</p> <ul style="list-style-type: none"> Drawings for a design idea <p>EP7 - Use of computer aided design (CAD)</p> <ul style="list-style-type: none"> Produce a 3D CAD model of a design proposal to include compound 3D shapes <p>R040: Design, evaluation, and modelling -</p> <p>EP8 - Product evaluation</p> <ul style="list-style-type: none"> Product analysis Carry out product disassembly <p>EP9 - Modelling design ideas</p> <ul style="list-style-type: none"> Methods of modelling 	<ul style="list-style-type: none"> C.17 Marking out C.18 Addition process C.19. Wasting processes C.20. Deforming processes C.21. Finishing processes C.22 Commercial processes <p><u>Materials and their properties</u></p> <ul style="list-style-type: none"> C.23 Sources and origin of plastic C.24 Thermoforming plastic C.25 Thermosetting plastic C.26 Density C.27 Conductivity C.28 Strength C.29 Hardness C.30 Toughness C.31 Malleability C.32 Elasticity C.33 Stock forms C.34 Reinforcing 	<p>Flowcharts, Circuit diagrams, Wiring diagrams</p> <p>2D engineering drawings using third angle orthographic projection, Standard conventions, Meaning of line types, Abbreviations, Representations of mechanical features, Advantages, and limitations of using CAD drawing software compared to manual drawing techniques</p> <p><u>EP4 - Evaluating design ideas</u></p> <p>Production of models, Qualitative comparison with the design brief and specification, Ranking matrices, Quality Function Deployment (QFD), Virtual (3D CAD), Card, Block, Breadboarding, 3D printing, Methods of measuring the dimensions and functionality of the product, Quantitative comparison with the design brief and specification, User testing, Reasons for identifying potential modifications and improvements to the design,</p> <p>R039: Communicating designs</p> <p><u>EP5 - Manual production of freehand sketches</u></p> <p>2D/3D sketches, Thick/thin lines, Texture, Tone Shading, Annotation, and labelling techniques, Produce an isometric sketch for a design proposal,</p>
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Year 8: Design Technology

Units	Unit 1 Pewter Casting (5 Lessons)	Unit 2 Acrylic memory keyring (4 lessons)	Unit 3 Sketching skills (9 lessons)
Unit Overview	In this unit students are introduced to Metals and several types of casting.	In this project students create a personalised keyring using Thermoformed Acrylic. The purpose of this project is to	In this unit students are introduced to CAD using SketchUp. They learn about the range of tools available whilst drawing a

	Students apply 2D drawing to be used on a laser cutter to produce a mould.	further develop their workshop skills, equipment, health, and safety, and reintroduce them to polymers.	house. They then apply this knowledge to draw a 3D model of their own bedroom. They also learn how to draw by hand using the Isometric, One-point / Two-point perspective methods.
Lesson Sequence	<ol style="list-style-type: none"> 1. Designing for Pewter Casting 2. Using 2D Design 3. Producing a design in 2D Design 4. Casting in Pewter /Producing a Production Plan 5. Finishing a Pewter Casting 	<ol style="list-style-type: none"> 1. Plastic Processes and Plastic Memory 2. Key Ring/Producing a Production Plan 3. Finishing an Acrylic Key Ring 4. Evaluation 	<ol style="list-style-type: none"> 1. Sketching in isometric 2. Sketching using 2 pt Perspective 3. Sketching using 2 pt perspective 4. Introduction to Sketchup 5. Continuing with Sketchup House 6. Continuing with Sketchup House 7. Completing the Sketchup House 8. Drawing a bedroom using Sketchup 9. Drawing a bedroom using Sketchup
Key Domains taught in this Unit	<p>D1. Industry and enterprise</p> <p>D2. Critical evaluation and disruptive technologies</p> <p>D4. Prototype development</p> <p>D5. Specialist tools and equipment</p> <p>D6. Materials and their properties</p>	<p>D4. Prototype development</p> <p>D5. Specialist tools and equipment</p> <p>D6. Materials and their properties</p>	<p>D2. Critical evaluation and disruptive technologies</p> <p>D4. Prototype development</p>
Key Concepts	<p>Scale of production</p> <p>CAD/CAM</p>	<p>Exploring design ideas</p> <p>Marking out</p>	<p>CAD/CAM</p> <p>Design strategies</p>



<p>taught in this Unit</p>	<p>Exploring design ideas Marking out Finishing processes Addition process Manufacturing processes Health and safety</p>	<p>Finishing processes Deforming processes Manufacturing processes Health and safety Thermoforming plastic</p>	<p>Exploring design ideas Communicating design ideas</p>
<p>KS4 End Points</p>	<p>EP1.To innovate and take e risks, to be resourceful, to be an enterprising and capable citizen.</p> <p>EP3.To be able to conduct primary and secondary research relating - aesthetic, technical, cultural, social, economic, industrial, and environmental issues. To understand and apply findings to inform design decisions.</p> <p>EP5.To combine practical and technological skills with creative thinking and problem solving to make products and systems to meet human needs</p> <p>EP6.To have and apply an understanding of a wide range of materials, being able to choose and justify their use in relation to their aesthetic, technical, economic, cultural, and physical properties.</p>	<p>EP2.To be a participant in advances in manufacturing, to be able utilise CAD (Computer Aided Design) CAM.</p> <p>EP5.To combine practical and technological skills with creative thinking and problem solving to make products and systems to meet human needs</p> <p>EP6.To have and apply an understanding of a wide range of materials, being able to choose and justify their use in relation to their aesthetic, technical, economic, cultural, and physical properties.</p>	<p>EP2.To be a participant in advances in manufacturing, to be able utilise CAD (Computer Aided Design) CAM.</p> <p>EP4.To Design products that solve real world and relevant problems within a variety of contexts, considering their own and other’s needs, wants and values</p>



Declarative Knowledge (Students should know)	<p>To know how a product is manufactured with traditional skills and industrial processes</p> <p>To understand that materials are sourced from material environment</p> <p>To know the original source of metals</p> <p>To be able to name a range of common workshop tools and explain their functions</p> <p>To know how to draw in 2D using relevant software</p> <p>To understand basic functions of a laser cutter</p>	<p>To know how a product is manufactured with traditional skills</p> <p>To understand that materials are sourced from material environment</p> <p>To know the original source of plastics</p> <p>To be able to name a range of common workshop tools and explain their functions</p>	<p>To know how to draw in 3D using SketchUp, in accurate detail</p> <p>To understand the variety of tools and what each of them can be used for</p> <p>To be able to name real world situations that 3D software is used to create products</p> <p>To know and recognise the three main hand drawing methods of Isometric, One-point / Two-point perspective</p>
Procedural Knowledge (Students should be able to do)	<p>To be able to identify workshop hazards</p> <p>To be able to follow workshop safety rules</p> <p>To be able to produce a mould</p> <p>To be able to measure accurately</p> <p>To be able to use wet and dry paper</p> <p>To be able to name a range of common workshop tools and explain their functions</p> <p>To be able to draw in 2D with relevant software</p> <p>To produce a casting in pewter from their design</p>	<p>To be able to identify workshop hazards</p> <p>To be able to follow workshop safety rules</p> <p>To be able name and create a jig</p> <p>To be able to use the pillar drill</p> <p>To be able to use wet and dry paper</p> <p>To be able to name a range of common workshop tools, machinery and explain their functions</p>	<p>To be able to apply the above knowledge in producing a House following on from demonstrations and tutorial access</p> <p>To then apply these developed skills in drawing their own bedroom accurately.</p> <p>To be able to draw shapes in Isometric accurately</p> <p>To be able to draw a house in Two-point perspective with a significant degree of accuracy</p>



<p>Developing T3 Literacy and Numeracy</p>	<p>Simple outline, indented, raised, air pockets, air bubbles, funnel, sprue, Select, line, circle, rectangle, grid lock, step lock, delete, group, move, copy, flip, rotate, mirror, goggles, burns, first aid, leather apron, leather gloves, enclosed shoes, hot area, cooling time, working space, tap to remove air bubbles, Stage, process, tools, equipment, safety, quality, Hack saw, junior hack saw, hand file, cross file, draw file, emery paper, wet and dry paper, apron, abrasive compound, leather gloves, Brasso liquid/wadding, plastic gloves, tissue paper.</p>	<p>Injection moulding, vacuum forming, blow moulding, rotational moulding, polymers, attraction, atoms, Van der Waals forces, Heat, 160°C, soften, wire/metal former, impress, pressure, clamp, cool, harden, sand, abrade, plastic memory, return, rise, previous thickness. Stage, process, tools, equipment, safety, quality control, Twist drill bit, pillar drill, clamp, scrap wood, hand file, cross file, draw file, emery paper, wet and dry paper, polisher, mop, goggles, apron, Inaccurate/ accurate, asymmetrical/ symmetrical, weak/ strong, unattractive/ attractive, improve, modify, change.</p>	<p>30, 60 and 120 degrees, construction lines, parallel, Isosketch, Bump stops, oval, ellipse, Circle, Horizon, Perspective, Vanishing point, projection lines, softly – faint lines, Birds eye view, eye level, Worms eye view. Tone shading, Sketchup, OneDrive, Folder, File, Download, upload, Zoom, orbit / rotate, Exact / precise. X-y-z axis. 3d – three dimensional. CAD (computer aided design), scale, rescale, move.</p>
<p>Assessment (Summative and Formative)</p>	<p>Summative assessment of practical outcome with written self-reflection evaluation, followed by formative feedback from the teacher.</p>	<p>Summative assessment of practical outcome with written self-reflection evaluation, followed by formative feedback from the teacher.</p>	<p>Summative assessment of practical outcome with written self-reflection evaluation, followed by formative feedback from the teacher. The bedroom drawing task is a mini summative assessment task that pupils self-review and then teacher formatively feeds back on.</p>
<p>Links to Prior Learning</p>	<p>From units 2 and 3 in Year 7. Being able to identify workshop hazards, Being able to follow workshop safety rules. To be able to name a range of</p>	<p>From units 2 and 3 in Year 7. Being able to identify workshop hazards, Being able to follow workshop safety rules. To be able to name a range of common workshop tools and explain their functions</p>	<p>From unit 3 in year 7, a small part of unit 1 in year 8. Pupils have had some computer / CAD time using Tinkercad and 2D design (only 3 lessons in total).</p>



SOUTH DOWNS

— LEARNING TRUST —

Design Technology & Engineering Year 8

	common workshop tools and explain their functions		
Next steps in learning	Building independent working and confidence, leads I to unit 1 and 2 in year 9	Building independent working and confidence, leads I to unit 1 and 2 in year 9	Building independent working and confidence, leads into unit 1 and 2 in year 9
Common Barriers to learning in this unit	Lack of prior knowledge – misconceptions of key concepts and lack of opportunity for practical experience and handling of tools and equipment in use of forming and shaping metals	Misconceptions of key concepts and lack of opportunity for practical experience (if attendance was impacted in year 7)	I cannot draw attitude – especially when it is technical.