Curriculum Plan – Design and Technology

Called as God's family,
we strive to achieve our personal best,
by living and learning in Christ.

Department Mission Statement - : All pupils and students at Hagley Catholic High School follow a taught course of Design and Technology. We focus on designing and prototyping but also cover areas relevant to Mathematics, English and Science; our approach is to offer students a practical way to apply their knowledge and skills from across their education, not just from our own subject area. We operate a carousel system in KS3 and deliver projects related to the use of papers and boards, metals, woods, plastics, CAD/CAM and electronics/systems and control. Our focus is on the four core strands of Investigation, Designing, Making and Testing and Evaluation. In KS4 we offer students the chance to study a GCSE in Design and Technology which offers them the freedom to explore their own thinking and realise their ideas in whatever materials best suit their final prototypes. Our aims are to prepare students for the wider world, to help them to go on to make well-informed choices as they go on to shape the future and to show them how the theory and skills they learn with us, and in their other subjects, can be put to a wider practical use.

Key Stage 2

Knowledge Gained	Skills Developed
Through a variety of creative activities, pupils should be taught the knowledge and understanding needed to engage in an iterative process of designing and making. They should work in a range of relevant contexts. They should be taught to use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose and aimed at particular individuals or groups. They should be shown how to investigate and analyse a range of existing products, how to evaluate their ideas and products against their own design criteria and consider the views of others to improve their work. They should understand how key events and individuals in design and technology have helped shape the world.	Through a variety of practical activities, pupils should be taught the skills needed to engage in an iterative process of designing and making. They should work in a range of relevant contexts. They should be taught how to generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design. They should be able to select from and use a wider range of tools and equipment to perform practical tasks accurately and be able to select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities. They should apply their understanding of how to strengthen, stiffen and reinforce more complex structures. They should understand and use mechanical systems in their products. They should understand and use electrical systems in their products and apply their understanding of computing to program, monitor and control their products.

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Key Stage 3 Knowledge and Skills Requirement (What knowledge and skills do pupils need to gain by the end of year 9?)

Knowledge To Be Built	Skills To Be Developed
When designing and making, pupils should be taught to: **Design** • use research and exploration, such as the study of different cultures, to identify and understand user needs • identify and solve their own design problems and understand how to reformulate problems given to them **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 **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 • apply computing and use electronics to embed intelligence in products that respond to inputs and control outputs using programmable components	When designing and making, pupils should be taught to: **Design** • use research and exploration, such as the study of different 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 **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, components and ingredients, 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

Key Stage 4 Knowledge and Skills Requirement (What knowledge and skills do pupils need to gain by the end of year 11?)

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Knowledge To Be Built	Skills To Be Developed
• The impact of new & emerging technologies • How new & emerging technologies inform design decisions • Energy • Modern & Smart materials • Electronic systems • Programmable components • Mechanisms • Papers & boards • Natural & manufactured timber • Ferrous & non-ferrous metals • Thermoforming & thermosetting polymers • Fabrics & textiles • Sources, origins & properties of materials • Factors affecting material selection • Forces & stresses • Stock forms, types & sizes of materials • Manufacturing processes • Fabrication, construction & assembly • Surface treatments & finishes • Using scientific vocabulary (units, symbols, quantities, materials) • Life cycle assessment & recycling	• Understanding design contexts • Identifying client & user needs • Design Brief & Specification • Environmental, social & economic factors • Developing ideas • Testing, analysing & evaluating ideas • Investigate & analyse the work of past & present designers • Using different design strategies • Design communication & annotation • Designing & developing prototypes • Decision making, feedback & suggesting modifications • Working with appropriate materials & components • Marking out, measuring & cutting (jigs, templates, etc.) • Using specialist tools & equipment • Using appropriate surface treatments & finishes • Arithmetic & numerical computation (sizes, scale, quantities) • Handling data (diagrams, charts, histograms) • Graphs (presenting, interpreting & translating data) • Geometry & trigonometry (measurements, patterns, 2D & 3D, area) • Using materials (properties, selection, energy, forces)

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Year Group	Scheme of Work	Knowledge Gained (Including How It Builds on Previous Knowledge Gained)	Skills Developed ((Including How It Builds on Previous Skills Gained)	Assessment of knowledge and skills
7	**Graphics and Design** This module focuses on levelling up basic drawing skills and	**Graphics and Design** • Health & Safety in a Graphic Design room • Safe use of cutting tools for compliant materials	**Graphics and Design** • Understanding design contexts • Identifying client & user needs • Use of shade, tone and colour • Design Brief & Specification	In Year 7 students move through a carousel system, which includes Food and Nutrition, where they will spend

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	techniques, including the use of colour, shade and tone and light sources. It also introduces the safe use of craft knives and other paper and card based cutting tools. We work through the design process and have a particular emphasis on accuracy of measuring and marking out. **Product Design** This module focuses on metal as a material and introduces students to the use of a basic range of tools and machinery, including pillar drills, files, glasspaper, etc. We use low-temperature casting as a process and have a particular emphasis on workshop safety. Students will	• Target markets and designing with different users in mind • Knowledge of papers and boards • Stock forms, types & sizes of materials • Fabrication, construction & assembly • Using scientific vocabulary (units, symbols, quantities, materials) • Using materials (properties, selection, energy, forces) **Product Design** • Health & Safety in a Product Design room • Safe use of cutting and shaping tools, equipment and machinery for resistant materials • Ferrous & non-ferrous metals • Sources, origins & properties of materials • Factors affecting material selection • Fabrication, construction & assembly • Surface treatments & finishes • Using scientific vocabulary (units, symbols, quantities, materials) • Using materials (properties, selection, energy, forces)	• Developing ideas • Using different design strategies • Design communication & annotation • Designing & developing prototypes • Working with appropriate materials & components • Marking out, measuring & cutting (jigs, templates, etc.) • Using specialist tools & equipment • Geometry & trigonometry (measurements, patterns, 2D & 3D, area) **Product Design** • Understanding design contexts • Identifying client & user needs • Design Brief & Specification • Environmental, social & economic factors • Developing ideas • Using different design strategies • Design communication & annotation • Designing & developing prototypes • Decision making, feedback & suggesting modifications • Working with appropriate materials & components	approximately 10 weeks in each subject area. Students will be formatively assessed throughout the module. Students will also be assessed on one task drawn from each of the four strands of Investigation, Design, Make, Test and Evaluate; this will generate their grade for the module. The combined grades from each of the modules will produce their overall grade for their end of Year report.

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	produce a piece of personalised jewellery. **Systems and Control** This module introduces students to the basics of electronic systems, with a focus on Input, Process and Output. We use copper tracks and students will create a personalised door handle hanger with a working circuit as a part of the design. Students will use soldering irons and we also introduce some CAD as a part of the final design.	**Systems and Control** • Health & Safety in a Systems & Control room • Safe use of heating, cutting and shaping tools, equipment and machinery for electronic components and resistant materials • Electronic systems • Natural & manufactured timber • Ferrous & non-ferrous metals • Thermoforming & thermosetting polymers • Sources, origins & properties of materials • Factors affecting material selection • Stock forms, types & sizes of materials • Fabrication, construction & assembly • Surface treatments & finishes • Arithmetic & numerical computation (sizes, scale, quantities) • Geometry & trigonometry (measurements, patterns, 2D & 3D, area)	• Marking out, measuring & cutting (jigs, templates, etc.) • Using specialist tools & equipment • Using appropriate surface treatments & finishes • Using materials (properties, selection, energy, forces) **Systems and Control** • Understanding design contexts • Identifying client & user needs • Design Brief & Specification • Environmental, social & economic factors • Developing ideas • Using different design strategies • Design communication & annotation • Designing & developing prototypes • Working with appropriate materials & components • Marking out, measuring & cutting (jigs, templates, etc.) • Using specialist tools & equipment	

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		• Using scientific vocabulary (units, symbols, quantities, materials) • Life cycle assessment & recycling • Using materials (properties, selection, energy, forces)		
8	**Graphics and Design** This module develops student's understanding of 3D sketching, with a design focus on Isometric drawing and rendering. We also cover 3D modelling and have an Investigation focus on the importance of the work of past and present designers as influences and inspiration for design thinking. **Product Design** This module focuses on wood as a material. Looking at	**Graphics and Design** • Stock forms, types & sizes of materials • Manufacturing processes • Fabrication, construction & assembly • Surface treatments & finishes • Investigate & analyse the work of past & present designers • Arithmetic & numerical computation (sizes, scale, quantities) • Using scientific vocabulary (units, symbols, quantities, materials) • Using materials (properties, selection, energy, forces) **Product Design** • Natural & manufactured timber • Stock forms, types & sizes of materials • Manufacturing processes	**Graphics and Design** • Understanding design contexts • Identifying client & user needs • Design Brief & Specification • Developing ideas • Testing, analysing & evaluating ideas • Using different design strategies • Design communication & annotation • Designing & developing prototypes • Decision making, feedback & suggesting modifications • Working with appropriate materials & components • Marking out, measuring & cutting (jigs, templates, etc.) • Using specialist tools & equipment • Geometry & trigonometry (measurements, patterns, 2D & 3D, area) **Product Design** • Understanding design contexts • Identifying client & user needs • Design Brief & Specification	In Year 8 students move through a carousel system, which includes Food and Nutrition, where they will spend approximately 10 weeks in each subject area. Students will be formatively assessed throughout the module. Students will also be assessed on one task drawn from each of the four strands of Investigation, Design, Make, Test and Evaluate; this will generate their grade for the module. The combined grades from each of the modules will produce their overall grade for their end of Year report.

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	tools, equipment, processes, materials and quality of finish. There is also a real focus on accuracy and suitability for purpose. **Systems and Control** This module develops students understanding of electronic components and circuits and moves from copper track to stripboard, as well as	• Fabrication, construction & assembly • Surface treatments & finishes • Arithmetic & numerical computation (sizes, scale, quantities) • Using materials (properties, selection, energy, forces) **Systems and Control** • Electronic systems • Thermoforming & thermosetting polymers • Stock forms, types & sizes of materials • Manufacturing processes • Fabrication, construction & assembly • Surface treatments & finishes • Arithmetic & numerical computation (sizes, scale, quantities)	• Developing ideas • Testing, analysing & evaluating ideas • Design communication & annotation • Designing & developing prototypes • Decision making, feedback & suggesting modifications • Working with appropriate materials & components • Marking out, measuring & cutting (jigs, templates, etc.) • Using specialist tools & equipment • Using appropriate surface treatments & finishes • Geometry & trigonometry (measurements, patterns, 2D & 3D, area) • Using scientific vocabulary (units, symbols, quantities, materials) **Systems and Control** • Understanding design contexts • Identifying client & user needs • Design Brief & Specification • Developing ideas • Testing, analysing & evaluating ideas • Design communication & annotation	

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	introducing L.D.R.s and variable resistors. We also cover CAD and CAM through the use of 2D Design and a CNC router.	• Using scientific vocabulary (units, symbols, quantities, materials)	• Designing & developing prototypes • Decision making, feedback & suggesting modifications • Working with appropriate materials & components • Marking out, measuring & cutting (jigs, templates, etc.) • Using specialist tools & equipment	
9	**Design and Technology** This module is a bridging unit into GCSE Design & Technology. We cover Smart and Modern materials, Biomimetics and Mechanics, along with a CAD/CAM design and make task.	**Design and Technology** • Impact of new & emerging technologies • How new & emerging technologies inform design decisions • Modern & Smart materials • Mechanisms • Sources, origins & properties of materials • Forces & stresses • Manufacturing processes • Fabrication, construction & assembly • Using scientific vocabulary (units, symbols, quantities, materials)	**Design and Technology** • Understanding design contexts • Identifying client & user needs • Design Brief & Specification • Developing ideas • Testing, analysing & evaluating ideas • Using different design strategies • Design communication & annotation • Designing & developing prototypes • Decision making, feedback & suggesting modifications • Working with appropriate materials & components • Marking out, measuring & cutting (jigs, templates, etc.) • Using specialist tools & equipment	In Year 9 students move through a carousel system, which includes Food and Nutrition and Health and Social Care, where they will spend approximately 10 weeks in each subject area. Students will be formatively assessed throughout the module. Students will also be assessed on one task drawn from each of the four strands of Investigation, Design, Make, Test and Evaluate; this will generate their grade for the module. The combined grades from each of the modules will produce their overall

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	Systems and Control This unit introduces programming into the elements of electronics that we have already covered. It also covers breadboarding and introduces PCB production.	**Systems and Control** • Impact of new & emerging technologies • Electronic systems • Programmable components • Thermoforming & thermosetting polymers • Sources, origins & properties of materials • Stock forms, types & sizes of materials • Manufacturing processes • Fabrication, construction & assembly • Arithmetic & numerical computation (sizes, scale, quantities) • Using scientific vocabulary (units, symbols, quantities, materials) • Using materials (properties, selection, energy, forces)	• Arithmetic & numerical computation (sizes, scale, quantities) • Geometry & trigonometry (measurements, patterns, 2D & 3D, area) • Using materials (properties, selection, energy, forces) **Systems and Control** • Understanding design contexts • Identifying client & user needs • Design Brief & Specification • Developing ideas • Testing, analysing & evaluating ideas • Designing & developing prototypes • Decision making, feedback & suggesting modifications • Working with appropriate materials & components • Using specialist tools & equipment	grade for their end of Year report.
10	**Design and Technology GCSE** During Year 10 students will spend the first 2.5 terms working through the	• The impact of new & emerging technologies • How new & emerging technologies inform design decisions • Energy • Modern & Smart materials	• Understanding design contexts • Identifying client & user needs • Design Brief & Specification • Environmental, social & economic factors • Developing ideas	In Year 10 students will complete a combination of theory and practical lessons. The theory topics are broken down into clear sections and each one has a homework-

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	theory content of the course and developing the practical skills necessary to attempt the N.E.A and the terminal examination. The theory and practice is delivered using a combination of taught lessons, homeworks and focussed practical tasks. We aim to develop student's ability to use tools, equipment and materials in a variety of resistant and compliant materials, including fabrics, papers and boards, wood, metal, plastic and electronic components and systems. Students then spend the last half term working through their N.E.A. project. This task is set biennially by the exam board.	• Electronic systems • Programmable components • Mechanisms • Papers & boards • Natural & manufactured timber • Ferrous & non-ferrous metals • Thermoforming & thermosetting polymers • Fabrics & textiles • Sources, origins & properties of materials • Factors affecting material selection • Forces & stresses • Stock forms, types & sizes of materials • Manufacturing processes • Fabrication, construction & assembly • Surface treatments & finishes • Using scientific vocabulary (units, symbols, quantities, materials) • Life cycle assessment & recycling	• Testing, analysing & evaluating ideas • Investigate & analyse the work of past & present designers • Using different design strategies • Design communication & annotation • Designing & developing prototypes • Decision making, feedback & suggesting modifications • Working with appropriate materials & components • Marking out, measuring & cutting (jigs, templates, etc.) • Using specialist tools & equipment • Using appropriate surface treatments & finishes • Arithmetic & numerical computation (sizes, scale, quantities) • Handling data (diagrams, charts, histograms) • Graphs (presenting, interpreting & translating data) • Geometry & trigonometry (measurements, patterns, 2D & 3D, area) • Using materials (properties, selection, energy, forces)	based assessment topic. Some of the units also have specific tests to identify where there are gaps in students' knowledge and understanding. The practical tasks are assessed against the relevant parts of the final N.E.A. mark scheme, using a combination of self, peer and teacher assessment, to ensure students understand how the mark scheme works and where they can improve. There will be a formal mock exam towards the end of the year to assess their overall progress and identify any gaps in their knowledge and understanding.

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11	**Design and Technology GCSE** During Year 11 students will spend the first 2 terms working through their N.E.A. project. This task is set biennially by the exam board. Students spend the third term on revision of learned topics and preparing for and taking their terminal exams.	• The impact of new & emerging technologies • How new & emerging technologies inform design decisions • Energy • Modern & Smart materials • Electronic systems • Programmable components • Mechanisms • Papers & boards • Natural & manufactured timber • Ferrous & non-ferrous metals • Thermoforming & thermosetting polymers • Fabrics & textiles • Sources, origins & properties of materials • Factors affecting material selection • Forces & stresses • Stock forms, types & sizes of materials • Manufacturing processes • Fabrication, construction & assembly • Surface treatments & finishes • Using scientific vocabulary (units, symbols, quantities, materials) • Life cycle assessment & recycling • Arithmetic & numerical computation (sizes, scale, quantities) • Handling data (diagrams, charts, histograms) • Graphs (presenting, interpreting & translating data)	• Understanding design contexts • Identifying client & user needs • Design Brief & Specification • Environmental, social & economic factors • Developing ideas • Testing, analysing & evaluating ideas • Investigate & analyse the work of past & present designers • Using different design strategies • Design communication & annotation • Designing & developing prototypes • Decision making, feedback & suggesting modifications • Working with appropriate materials & components • Marking out, measuring & cutting (jigs, templates, etc.) • Using specialist tools & equipment • Using appropriate surface treatments & finishes • Arithmetic & numerical computation (sizes, scale, quantities) • Handling data (diagrams, charts, histograms) • Graphs (presenting, interpreting & translating data)	Students N.E.A. work is assessed against the framework provided by the exam board and then externally moderated by the exam board. The project is marked out of 100 and constitutes 50% of the total marks for the course. There will be a formal pre-public exam (usually around Christmas time) to assess students progress and preparedness for the final exam. Students will sit a terminal exam during the summer of Year 11. This exam is one hour and fourty five minutes in length. The exam has two sections; the first section will assess their knowledge of the overall curriculum and is worth 40 marks, the second section will assess their knowledge of a specialist materials area and is worth 60 marks.

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		• Geometry & trigonometry (measurements, patterns, 2D & 3D, area) • Using scientific vocabulary (units, symbols, quantities, materials) • Life cycle assessment & recycling • Using materials (properties, selection, energy, forces)	• Geometry & trigonometry (measurements, patterns, 2D & 3D, area) • Using scientific vocabulary (units, symbols, quantities, materials) • Life cycle assessment & recycling • Using materials (properties, selection, energy, forces)	