Roundwood Park School

KS4 Design and Technology GCSE (9-1) OCR

The aims and objectives of GCSE Design and Technology are to enable students to:

- Develop an awareness and understanding of real-life experiences in designing and in the developments and opportunities seen in creative, manufacturing and engineering industries.
- Demonstrate their understanding that all design and technological activity takes place within contexts that influence the outcomes of design practice.
- Develop an experienced understanding of an iterative design process and the relevance of these to industry practice.
- Develop realistic design proposals as a result of the exploration of design opportunities and users' (and stakeholders) needs, wants and values.
- Use imagination, experimentation and combine ideas when designing.
- Develop the skills to critique and refine their own ideas whilst designing and making.
- Communicate their design ideas and decisions using different media and techniques, as appropriate for different audiences at key points in their designing.
- Develop decision making skills, including the planning and organisation of time and resources when managing their own project work.
- Develop a broad knowledge of materials, components and technologies and practical skills to develop high quality, imaginative and functional prototypes.
- Become independent and critical thinkers who can adapt their technical knowledge and understanding to different design situations.
- Be ambitious and open to explore and take design risks in order to stretch the development of design proposals, avoiding clichéd or stereotypical responses.
- Consider the costs, commercial viability and marketing of products.
- Demonstrate safe working practices in Design and Technology.
- Use key Design and Technology terminology including those related to: designing, innovation and communication; materials and technologies; making, manufacture and production; critiquing, values and ethics.
- Engage learners with routes that are open to them when progressing to a GCSE qualification, apprenticeship or in a future career in the field.

Assessment objectives:

A01: Identify, investigate and outline design possibilities to address needs and wants.

A02: Design and make prototypes that are fit for purpose.

A03: Analyse and evaluate –

- Design decisions and outcomes, including for prototypes made by themselves and others.
- Wider issues in design and technology.

A04: Demonstrate and apply knowledge and understanding of –

- Technical principles.
- Designing and making principles.

A01 = Explore, A02 = Create, A03 = Evaluate

Introduction:

In year 10 the design and technology course is divided into two NEA sessions per week. One of the lessons will give learners an understanding of what is required when they begin the Iterative Design Challenge (J310/02 or 03) project in year 11. The other lesson will allow learners to practice mini run through based projects in preparation. There will be a third lesson which will teach learners the theory required for the Principles of Design and Technology examination (J310/01).

In year 11, two lessons per week are provided for learners to complete the NEA (Iterative Design Challenge) and one lesson per week is provided for preparing learners for the Principles of Design and Technology examination and covering the theory required.

The NEA (Iterative Design Challenge) guides and assesses learners under the following 5 strands and is worth 50% of the overall GCSE mark. Leaving the other 50% towards the examination.

Strand 1 – Explore (AO1)

- Investigations of the context
- Design brief
- Investigations of user and stakeholder needs and wants and the outlining of stakeholder requirements (non-technical specification)
- Investigations of existing products and design practices
- Exploration of materials and possible technical requirements
- Technical specification.

Strand 2 – Create: Design thinking (AO2)

- Generation of initial ideas
- Design developments
- Development of final design solution(s)
- Critical thinking

Strand 3 – Create: Design communication (AO2)

- Quality of chronological progression
- Quality of initial ideas
- Quality of design developments
- Quality of final design solution(s)

Strand 4 – Create – Final prototype(s) (AO2)

- Quality of planning for making the final prototype(s)
- Quality of final prototype(s)
- Use of specialist techniques and processes
- Use of specialist tools and equipment
- Viability of the final prototype(s)

Strand 5 – Evaluate (AO3)

- Analysis and evaluation of primary and/or secondary sources
- Ongoing evaluation to manage design progression
- Feasibility of the design solution
- Evaluation of the final prototype(s)

Year / term	Unit of work	Assessment
Year 10 Autumn Term	**1.1 How can exploring the context a design is intended for inform decisions and outcomes?** • Where and how the product or system is used. • Identifying primary user and wider stakeholder requirements. • Investigation of social, cultural, moral and economic factors tom identify opportunities and constraints can influence the design process. **1.2 Why is usability an important consideration when designing prototypes?** • The impact of a solution on a user's lifestyle. • The ease of use and inclusivity of design solutions. • Ergonomic consideration and anthropometric data to support ease of use. • Aesthetics consideration. **2.1 What are the opportunities and constraints that influence design and making requirements?** • Materials, components and processes that have been used. • The influence of marketing and branding. • Impact on society. • Impact on usability. • Impact on the environment; lifecycle assessment. • Work of past and present professionals and companies in the area of Design and Technology. **2.2 How do developments in Design and |Technology influence design decisions and practice?** • Ethics. • The environment. • Product enhancement **3.1 What are the impacts of new and emerging technologies when developing design solutions?** • Industry and enterprise, such as the circular economy. • People, in relation to lifestyle, culture and society. • Environment. • Sustainability. **3.2 How do designers choose appropriate sources of energy to make products and power systems?** • The generation of electricity and how energy is stored and transferred. • Appropriate use in products and systems of renewable and non-renewable energy • Fossil fuels, nuclear fuel, bio-fuel. • Wind, hydro-electricity, tidal and solar. **3.3 What wider implications can have an influence on the processes of designing and making?** • Environmental initiatives. • Fair trade. • Social and ethical awareness. • Global sustainable development.	• End of unit assessments • Textbook activities • Exam practice booklet • Weekly home learning activities • Exam questions • Keyword spelling tests

Year / term	Unit of work	Assessment
	4.1 How can design solutions be communicated to demonstrate their suitability to a third party? • 2D and 3D sketches with notes. • Sketch modelling. • Exploded drawings. • Mathematical modelling. • Flowcharts. **4.2 How do designers source information and thinking when problem solving?** • User-centred design • Systems thinking • Collaboration to gain specialist knowledge from across subject areas when delivering solutions in design and manufacturing industries.	•
Super Curricular	1. Research an article on a designer of interest such as Alessi or Dyson. 2. Research an article of new technology. 3. Research a sustainable design initiative such a solar panel, wind power. 4. Research a recognised design/ landmark in London such as the Gerkhin, Shard, London Bridge or London eye. 5. Research the Tate Modern or the Cartoon museum in Bloomsbury. **6. Attend the annual MBDA Glider challenge (November).** 7. Guest speaker visit.	

Year / term	Unit of work	Assessment
Year 10 **Spring Term**	**4.2 How do designers source information and thinking when problem solving? (Continued)** • User-centred design • Systems thinking • Collaboration to gain specialist knowledge from across subject areas when delivering solutions in design and manufacturing industries. **5.1 What are the main categories of materials available to designers when developing design solutions?** • Papers and boards. • Natural and manufactured timbers. • Ferrous and non-ferrous metals. • Thermo and thermosetting polymers. • Textiles fibres and fabrics. • Modern and smart materials. • Composite materials. • Technical textiles. **5.2 What factors are important to consider when selecting appropriate materials and/ or system components when designing?** • Material characteristic properties. • Physical and working properties. • How easy they are to work with. • Required functionality. • Aesthetic attributes. • Environmental considerations. • Availability and cost of stock forms. • Social, cultural and ethical consideration. **5.3 Why is it important to understand the sources or origins of materials and/or system components?** • Sources and origins of specific materials. • Overview of processes used to extract and/ or convert the source material into a workable form. • Consideration of the ecological, social and ethical issues associated with processing materials. • Mining, harvesting, manufacturing and transporting. • Lifecycle assessment. • Recycling and sustainability schemes. • Eco-materials. • Upcycling	• End of unit assessments • Textbook activities • Exam practice booklet • Weekly home learning activities • Exam questions • Keyword spelling tests • Mock examination

Year / term	Unit of work	Assessment
	5.4 Why is it important to know the difference available forms of specific materials and/ or systems components? • Awareness of commonly available forms and standard units of measurement of specific materials and/ or system components when calculating costs and quantities. • Weights and sizes. • Stock form choices. • Standard components. **6.1 What gives a product structural integrity?** • Reinforcement to withstand forces and stresses. • Triangulation. • Plastic webbing. **6.2 How can materials and products be finished for different purposes?** • Function, such as: durability and added resistance to overcome environmental factors. Aesthetics.	
Super Curricular	1. **Attend the annual Rotary Tournament (March).** 2. Interview a design professional such as an architect, engineer, graphic designer or teacher. 3. Arrange a visit to the V&A London. 4. Arrange a visit to the Henry Moore sculpture studios and gardens. 5. Arrange a visit to the design centre London. 6. Guest speaker visit.	

Year / term	Unit of work	Assessment
Year 10 Summer Term	**6.3 How do we introduce controlled movement to products and systems?** • Types of movement. • Rotary, reciprocating, linear and oscillating. • Forces. • Mechanical devices. **6.4 How do electronic systems provide functionality to products and processes?** • Sensors. • Switches • Lights • Speakers and buzzers • Motors • Microcontrollers **7.1 How can materials and processes be used to make iterative models?** • Techniques used for building early stage models. **7.2 How can materials be manipulated and joined in different ways in a workshop environment when making final prototypes?** • Specialist tools, equipment and techniques. **7.3 How do designers and manufacturers ensure accuracy when making prototypes and products?** • Use of appropriate and accurate marking out methods. • Measuring and use of reference points, lines and surfaces. • Templates and jigs. • Working with tolerances. • Understanding efficient cutting and how to minimise waste. **7.4 How do industry professionals use digital design tools when exploring and developing design ideas?** • Use of 2D and 3D digital technology/ tools to present models, design and manufacturing solutions. • Rapid prototyping. • Image creation and manipulation software. • Digital manufacture. • Interpretation of plans, elevations of 3D models. • CAD, CAM and CAE. **7.5 How do processes vary when manufacturing products to different scales of production?** • Scale of production types • One-off, bespoke. • Batch production. • Mass production. • Lean manufacturing and just-in-time (JIT) methods.	• Mock examination review • End of unit assessments • Textbook activities • Exam practice booklet • Weekly home learning activities • Exam questions • Keyword spelling tests • OCR release the NEA contexts (choice of three). • Students begin the planning for their NEA • NEA (50% of the overall GCSE)

	• Awareness of processes used to deal with larger scale of production. **7.6 How do new and emerging technologies have an impact on production techniques and systems?** • Consideration of economies of scale. • How disruptive technologies such as 3D printing and robots are changing manufacturing. **8.1 How can cost and availability of specific materials and / or system components affect their selection when designing?** • The significance of costing. • Commercial viability. • Different stakeholder needs and marketability. • Calculating quantities, costings and sizes of materials and/ or components.	
Super Curricular	**1. Visit the British Standards Institute workshops and tour.** 2. Guest speaker visit. 3. Attend a design seminar/ talk and record your experience. 4. Research 15 facts on a design of your choice. 5. Research 10 products where biomimicry has been used to develop a design.	

Year / term	Unit of work	Assessment
Year 11 Autumn Term	**2x lessons per week assigned to completion of the NEA (Iterative design challenge) 50% overall GCSE** **Strand 1** – Explore (A01) • Investigations of the context. • Design brief. • Investigation of user and stakeholder needs and wants and outlining stakeholder requirements. • Investigation of existing products and design practices. • Explanation of materials and possible technical requirements. • Technical specification **Strand 2** – Create: design thinking (A02) • Generation of initial ideas • Design developments • Development of final design solution(s) • Critical thinking **1x lesson per week covering exam theory topics (Principles of design and technology) 50% overall GCSE** **1.1 How can exploring the context a design is intended for inform decisions and outcomes?** • Where and how the product or system is used. • Identifying primary user and wider stakeholder requirements. • Investigation of social, cultural, moral and economic factors tom identify opportunities and constraints can influence the design process. **1.2 Why is usability an important consideration when designing prototypes?** • The impact of a solution on a user's lifestyle. • The ease of use and inclusivity of design solutions. • Ergonomic consideration and anthropometric data to support ease of use. • Aesthetics consideration. **2.1 What are the opportunities and constraints that influence design and making requirements?** • Materials, components and processes that have been used. • The influence of marketing and branding. • Impact on society. • Impact on usability. • Impact on the environment; lifecycle assessment. • Work of past and present professionals and companies in the area of Design and Technology. **2.2 How do developments in Design and |Technology influence design decisions and practice?** • Ethics.	• Mock examination review from year 10 • Textbook activities • Exam practice booklet • Weekly home learning activities • Exam questions • Keyword spelling tests • Students begin their NEA project • NEA (50% of the overall GCSE)

	• The environment. • Product enhancement **3.1 What are the impacts of new and emerging technologies when developing design solutions?** • Industry and enterprise, such as the circular economy. • People, in relation to lifestyle, culture and society. • Environment. • Sustainability. **3.2 How do designers choose appropriate sources of energy to make products and power systems?** • The generation of electricity and how energy is stored and transferred. • Appropriate use in products and systems of renewable and non-renewable energy • Fossil fuels, nuclear fuel, bio-fuel. • Wind, hydro-electricity, tidal and solar. **3.3 What wider implications can have an influence on the processes of designing and making?** • Environmental initiatives. • Fair trade. • Social and ethical awareness. • Global sustainable development. **4.1 How can design solutions be communicated to demonstrate their suitability to a third party?** • 2D and 3D sketches with notes. • Sketch modelling. • Exploded drawings. • Mathematical modelling. • Flowcharts. **4.2 How do designers source information and thinking when problem solving?** • User-centred design • Systems thinking • Collaboration to gain specialist knowledge from across subject areas when delivering solutions in design and manufacturing industries.	
Super Curricular	1. Explore new and emerging technologies in order to be able to discuss or consider using these in your NEA. You can do this by reading the above magazines or searching the internet. 2. Visit a local university degree shows to get an idea of future study pathways for D&T.	

Year / term	Unit of work	Assessment
Year 11 **Spring Term**	**2x lessons per week assigned to completion of the NEA (Iterative design challenge) 50% overall GCSE** **Strand 4** – Final prototype(s) (A02) • Quality of planning for making the final prototype(s). • Quality of final prototype(s). • Use of specialist techniques and processes. • Use of specialist tools and equipment. • Viability of the final prototype(s). **Strand 5** – Evaluate (A03) • Analysis and evaluation of primary and/ or secondary sources. • Ongoing evaluation to manage design progression. • Feasibility of the final prototype(s). • Evaluation of the final prototype(s). **1x lesson per week covering exam theory topics (Principles of design and technology) 50% overall GCSE** **4.2 How do designers source information and thinking when problem solving? (Continued)** • User-centred design • Systems thinking • Collaboration to gain specialist knowledge from across subject areas when delivering solutions in design and manufacturing industries. **5.1 What are the main categories of materials available to designers when developing design solutions?** • Papers and boards. • Natural and manufactured timbers. • Ferrous and non-ferrous metals. • Thermo and thermosetting polymers. • Textiles fibres and fabrics. • Modern and smart materials. • Composite materials. • Technical textiles. **5.2 What factors are important to consider when selecting appropriate materials and/ or system components when designing?** • Material characteristic properties. • Physical and working properties. • How easy they are to work with.	• Past exam papers • Textbook activities • Exam practice booklet • Exam questions • Keyword spelling tests • Deadline for the NEA project • NEA (50% of the overall GCSE)

	• Required functionality. • Aesthetic attributes. • Environmental considerations. • Availability and cost of stock forms. • Social, cultural and ethical consideration. **5.3 Why is it important to understand the sources or origins of materials and/or system components?** • Sources and origins of specific materials. • Overview of processes used to extract and/ or convert the source material into a workable form. • Consideration of the ecological, social and ethical issues associated with processing materials. • Mining, harvesting, manufacturing and transporting. • Lifecycle assessment. • Recycling and sustainability schemes. • Eco-materials. • Upcycling. **5.4 Why is it important to know the difference available forms of specific materials and/ or systems components?** • Awareness of commonly available forms and standard units of measurement of specific materials and/ or system components when calculating costs and quantities. • Weights and sizes. • Stock form choices. • Standard components. **6.1 What gives a product structural integrity?** • Reinforcement to withstand forces and stresses. • Triangulation. • Plastic webbing. **6.2 How can materials and products be finished for different purposes?** • Function, such as: durability and added resistance to overcome environmental factors. • Aesthetics.	
Super Curricular	1. Investigate UniFROG to discover at least 5 careers that you could undertake if you choose a career in design. Make a log of what appeals to you. 2. Watch relevant episodes on the BBC documentary 'Inside the factory' to understand production methods.	

Year / term	Unit of work	Assessment
Year 11 Summer Term	**3x lesson per week covering theory topics (Principles of design and technology) 50% overall GCSE leading up to final summer examination.** **6.3 How do we introduce controlled movement to products and systems?** • Types of movement. • Rotary, reciprocating, linear and oscillating. • Forces. • Mechanical devices. **6.4 How do electronic systems provide functionality to products and processes?** • Sensors. • Switches • Lights • Speakers and buzzers • Motors • Microcontrollers **7.1 How can materials and processes be used to make iterative models?** • Techniques used for building early stage models. **7.7 How can materials be manipulated and joined in different ways in a workshop environment when making final prototypes?** • Specialist tools, equipment and techniques. **7.8 How do designers and manufacturers ensure accuracy when making prototypes and products?** • Use of appropriate and accurate marking out methods. • Measuring and use of reference points, lines and surfaces. • Templates and jigs. • Working with tolerances. • Understanding efficient cutting and how to minimise waste. **7.9 How do industry professionals use digital design tools when exploring and developing design ideas?** • Use of 2D and 3D digital technology/ tools to present models, design and manufacturing solutions. • Rapid prototyping. • Image creation and manipulation software. • Digital manufacture. • Interpretation of plans, elevations of 3D models. • CAD, CAM and CAE. **7.10 How do processes vary when manufacturing products to different scales of production?** • Scale of production types • One-off, bespoke.	• Past exam papers • Textbook activities • Exam practice booklet • Keyword spelling tests

	• Batch production. • Mass production. • Lean manufacturing and just-in-time (JIT) methods. • Awareness of processes used to deal with larger scale of production. **7.11 How do new and emerging technologies have an impact on production techniques and systems?** • Consideration of economies of scale. • How disruptive technologies such as 3D printing and robots are changing manufacturing. **8.1 How can cost and availability of specific materials and / or system components affect their selection when designing?** • The significance of costing. • Commercial viability. • Different stakeholder needs and marketability. • Calculating quantities, costings and sizes of materials and/ or components.	
Super Curricular	1. Design magazines such as Dezeen, Eye and Design week to keep up-to-date with new designers, products and ideas. 2. Visit the 'New Designers' exhibition in London to see the latest innovative design ideas from the most up and coming designers.	