Design & Technology Department – Year 10

Shirley High Curriculum Map

The aim of the Year 10 curriculum is to prepare students for the GCSE exam and NEA by working through a mini GCSE project that will allow them to build skills in both design and manufacture. Relevant subject knowledge will be delivered and assessed throughout this process at appropriate points as the project develops.

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	Theme/Topic/Skill: GCSE Content Project Design	Theme/Topic/Skill: Design Development	Theme/Topic/Skill: Project Manufacture	Theme/Topic/Skill: Project Testing & Evaluation	Theme/Topic/Skill: Systems and Mechanisms	Theme/Topic/Skill: GCSE Project Start Investigating the Context
Why Now?	Learners will be introduced to the key concepts of energy, new and emerging technologies and sustainability. This builds on their study of the materials as part of the KS3 curriculum and provides opportunities for retrieval. Pupils will create their own practice NEA 1 and design a project of their own design brief.	Teaching pupils about the different classification of materials and exploring composites, smart and modern materials. Pupils will create their own models and final technical drawings for practice NEA 1 .	Learners will be exploring human interaction and design and will explore designers try to design for all. Pupils will create their own practice NEA 2 and design a project of their own design brief.	Teaching pupils about the work of other designs and different design movements in history and how these influences are used. Pupils will create their own models and final technical drawings for practice NEA 2 .	Teaching pupils about different production methods, systems and stock forms of materials and raw sources. Pupils will use the work of others to inspire their design work for practice NEA 2 .	Teaching pupils about different types of research designers use Pupils will start working on their NEA and they will work on a context provided by the exam board and write and plan their own design brief and project.
Fundamental Concepts	NEA and Exam content Design Brief & Design Specification	Design drawing and modelling Planning from manufacture.	Making the prototype Selection and safe use of tools and equipment	Project assembly and completion, applying finishes and testing against customer requirements	Small projects to investigate Mechanical and Electronic systems and a Systems approach to design	Investigate design possibilities for the GCSE Non Examined Assessment.
Students will...	**Introduction to the Subject content** and GCSE assessment. The Non Examined Assessment (NEA) The Examined assessment **Design & Make Project (NEA Practice)** The students will be introduced to a mini GCSE project for a given Context and Design Brief. (e.g. The Stool Project – To design and make a low cost stool for home, suitable for batch production, using sustainable materials.) **Investigate Design Possibilities** Students to investigate client needs: Questionnaires conduct interviews and analyse result statistics. ***(This has Links to English & Maths)*** Students to investigate existing designs: Looking at Design, function, materials, production & costs. **Write a Design Brief and Specification:** Students to write a Design Brief in relation to the Context and needs. Students to write a formal Design Specification which identifies and justifies Specific requirements. ***(This has links to English)*** **Design ideas** Students will generate creative Design Ideas to meet the specification. The following topics will be explored alongside project work: **Materials and their working properties:** Paper and Boards Natural and Manufactured Timber Metals and Alloys Polymers Primary sources and processing of materials including Ecological and social footprint. **6Rs Reduce, refuse, re-use, repair, recycle and rethink** **Communication of ideas:** Freehand Sketching, Isometric, Oblique, Perspective, Rendering & annotation	**Design Development** Students will learn to explore and develop ideas by: Sketching Modelling Testing Evaluation to improve outcomes. **Design Communication** Students will learn to develop and annotate drawings and produce working drawings in 3rd angle orthographic using conventions, dimensions and drawn to scale. **Design Evaluation** Designs will be evaluated against the design specification and students will be taught to evaluate and develop work throughout the project. **CAD Modelling** Students will learn to model their final design using 3D CAD and from this create accurate Isometric and orthographic dimensioned drawings. **Planning** Students will learn to plan for manufacture. This will include Manufacturing Specification, Parts list / cutting list Plan for manufacture Gantt chart. The following topics will be explored alongside project work: **Scale of production:** One off (eg Prototype) Batch Mass Continuous **Production techniques and systems:** Automation Computer aided design (CAD) Computer aided manufacture (CAM) Flexible manufacturing systems(FMS) Just in time (JIT) **New and emerging technologies :** Automation Robotics The development of tools and equipment Developments in new materials: (Smart and Modern Materials, Composite Materials)	**Manufacture** Students will develop and demonstrate practical skills to make their prototype design. Design improvements will be made and recorded as the prototype develops. **Safety** Students will learn and demonstrate safe and appropriate use of tools and equipment and Risk assessment. **Practical skills** Students will develop and demonstrate skills in Marking out and setting up for manufacture Cutting and shaping Forming Joining and assembly Finishing Measurement and Quality control The following topics will be explored alongside project work: **Selection of materials and components**: Functionality: (relevant properties) Aesthetics: finish, texture and colour. Environmental Factors: 6Rs Availability and Cost **Material management:** Planning of cutting and shaping to minimise waste e.g. nesting of shapes and parts to be cut from material. **Quality Control** Working accurately using tolerances	**Advanced Manufacture** Students will complete manufacturing processes including specialist equipment and CAM such as 3D printing and CAM Vinyl cutting. **Assembly & finish** Students will complete practical work assemble parts and apply finishes. **Testing & Evaluation** Completed projects will be tested and evaluated against the specification and client need. The following topics will be explored alongside project work: **Surface treatments and finishes:** Surface treatments and finishes applied for functional and aesthetic purposes. Understand how to prepare materials for surface treatment. **Specialist techniques and processes:** How to use measurement/reference points, templates, jigs and patterns where suitable. Tools, equipment and processes: Wastage, such as: die cutting, perforation, turning, sawing, milling, drilling, cutting and shearing. Addition, such as: brazing, welding, lamination, soldering, 3D printing, bonding, printing. Deforming and reforming such as: vacuum forming, creasing, bending, blow moulding, casting, injection moulding and extrusion. **Enterprise** The use of crowd funding. The effect virtual marketing and retail. How co-operatives can encourage innovation. How fair trade can help develop a fairer business model. Sustainability. The impact on finite and non-finite resources. Methods of waste disposal. **People** How technology push/market pull affects choice Changing job roles due to the emergence of new ways of working driven by technological change.	**Systems Mini Project:** Students will build an electronic system and learn to apply a systems approach to designing: They will identify Input, Process and Output Components Inputs: Switches & Sensors Process: common IC and programmable microcontrollers Outputs: Light, sound & movement **Mechanical Systems** Students will undertake practical exercises to model mechanical systems and demonstrate mechanisms and motion. Students will learn the functions of mechanical devices to produce Linear, Rotary, Reciprocating and Oscillating movements. This will include the study of Levers, Linkages, Cams and Gears. The following topics will be explored: **Energy generation and storage:** Students should understand how energy is generated and stored and how this is used as the basis for the selection of products and power systems. **Fossil fuels** How power is generated from coal, gas and oil including the arguments for and against. **Nuclear power** How nuclear power is generated and the arguments for and against. **Renewable energy** How power is generated from, wind, solar, tidal, hydro-electrical and biomass. Arguments for and against the selection of renewable energy. Energy storage systems including batteries Kinetic pumped storage systems Alkaline and re-chargeable batteries	**Design Context** Students to choose the NEA Design Context from the exam board options. They will investigate design possibilities from this context and identify possible problems they could solve or designs they could improve upon. **Clients** Students will identify a possible client or clients and approach them to identify their design requirements. **Work of others** Students will investigate the work of others, including the study of designers and an analysis of existing designs. **Design Brief** Students will write a Design Brief that summarises the design problem to be solved for the identified client. **Design Specification** Students will write a detailed design specification for the design problem. This will give specific requirements which are justified by client needs, existing designs and other factors, such as ergonomics, material properties, costs etc. **Design ideas** Students will generate creative Design Ideas to meet the specification. The following topics will be explored as part of the design process : The work or others (Designers Harry Beck, Dyson, Alesssi etc) Biomimicry Ergonomics (Anthropometrics) Aesthetics. Planned obsolescence Design for maintenance The environment New and emerging technologies The impact on society including culture, fashion, ethics, religion, social and economic factors
Language for Life (Key terms/Vocabulary)	Design Context, Design Brief and Design Specification.	CAD, CAM, JIT, FMS, Smart materials, composite materials	Quality Control, Quality Assurance, Accuracy tolerance. 6Rs of sustainability Rethink, Refuse, Reduce, Reuse, Recycle, Replace	Wastage, die cutting, perforation, turning, sawing, milling, drilling, cutting and shearing, brazing, welding, lamination, soldering, 3D	Input, Process, Output, Linear, Rotary, Reciprocating, Oscillating, Levers, Linkages, Cams, Gears, wind power, solar	Biomimicry, Ergonomics, Anthropometrics, Aesthetics, Planned obsolescence

				printing, bonding, deforming, reforming, vacuum forming, creasing, bending, blow moulding, casting, injection moulding and extrusion.	power, tidal power, hydro-electric, biomass, renewable energy, energy storage systems, Kinetic pumped storage systems, alkaline and rechargeable batteries.	
Extended writing Opportunities	Formal writing of a design brief and Specification	Evaluation of designs against the design specification and client needs	Recording manufacturing stages and justifying changes or development	Evaluation of designs against the design specification and client needs	Discussing Energy generation and storage	Analysis of the context and writing a formal Design Brief and Design Specification
Maths Across the Curriculum	Statistical analysis of client feedback	Graphics, volumes, areas, scale, nets, modelling	Nesting and minimising waste. Working to dimensions and tolerances	Accuracy & Dimensional Tolerances	Types of motion, movement, mechanical advantage	Statistical analysis of client feedback
Links to careers/ aspirations	Engineers / Product designers/ Architects, Trades position in engineering, drafting & construction	Engineers / Product designers/ Architects, Trades position in engineering, drafting & construction	Engineers / Product designers/ Architects, Trades position in engineering, drafting & construction	Engineers / Product designers/ Architects, Trades position in engineering, drafting & construction	Engineers / Product designers/ Architects, Trades position in engineering, drafting & construction	Engineers / Product designers/ Architects, Trades position in engineering, drafting & construction
Cultural Capital	The project will include research into traditional basic designs across cultures.	Students will look at systems used in industry for manufacture and they should get feedback on their design ideas	Students will select materials and processes locally and will consider environmental effects of these.	Projects will be evaluated against the original specification and 'Client' requirements outside school.	Students will look at mechanical and electrical systems at home and in the 'real' world outside school	Students interview a 'client' or 'clients' outside school to identify the need for a project and incorporate this into their Design Specification
Practical Application of Skills	Sketching and graphical communication skills	Design Drafting	Practical workshop skills using hand tools for wood metal and plastic	Applying surface finishes	Greater understanding of systems at home including gearing on bicycles.	Graphical skills, Interview skills & interpreting statistical information