



Curriculum Intent

The focus of Design and Technology is to enable students to approach ideas in both a literal and lateral manner, providing them with the skills to effectively communicate ideas, designs and processes in a professional manner to industry standard. Students will use their knowledge of Maths and Science and apply it to their work to create both their own designs as well as a commercially viable product. Students will be introduced to a varied diet of tools and machinery that is commonplace in the design industry, developing skills which will eventually allow them to complete GCSE projects.

Autumn Term | Design and Technology | Metals

Students will learn:-

Students should have an overview of the main categories and types of metals and alloys:

ferrous metals including:

- low carbon steel
- cast Iron
- high carbon/tool steel

non-ferrous metals including:

- aluminum copper tin
- zinc

alloys including:

- brass
- stainless steel
- high speed steel.

Fossil fuels

How power is generated from:

- coal
- gas
- oil.

Arguments for and against the selection of fossil fuels.

Nuclear Power

How nuclear power is generated.

Arguments for and against the selection of nuclear power.

Renewable Energy

How power is generated from:

- wind
- solar
- tidal
- hydro-electrical • biomass.

Arguments for and against the selection of renewable energy.

Mechanical devices

The functions of mechanical devices to produce linear, rotary, reciprocating and oscillating movements.

Levers

- first order
- second order
- third order.

Linkages

- bell cranks
- push/pull.

Rotary systems

- CAMs and followers
- simple gear trains
- pulleys and belts.

How will we assess impact?

- Recapping knowledge with plenary and starter activities
- End of unit testing
- Peer and self-assessment

Knowledge, understanding & Skills

Know

- Recap on using the workshop in a safe manner. Workshop rules and guidelines.
- Students learn the origin of Metal.
- Processing methods and refinery to create modern metals
- Students learn the differences structures and properties of plastic
 - Properties
 - Ferrous/ Non Ferrous
 - Alloy metals
 - Characteristics when heated.
 - Life cycle
 - Visual appearance
 - Applications to products
- An understanding of manufacturing and shaping processes.
- Students learn about energy sources both
- Students learn the difference between finite and non-finite resources.
- Students will understand motion and forces.
- Knowledge of Linkages, CAMS and rotary systems – to allow them to design their Moving toy.

Apply

- Apply knowledge of plastics to be able to identify different types of metals from their properties or their intended uses.
- Explain the basic properties of Ferrous and non Ferrous
- Interpret information provided to decide on the suitability/ potential to be sustainable.

What does excellence look like?

- Explain in detail the working properties of different Metals and apply them successfully to products.
- Students can identify sustainable products and/or alter Metal products to make them sustainable.
- Students can identify the manufacturing process of a product.
- Students can apply their knowledge to correctly apply their knowledge of Metals and Manufacturing methods to their design ideas.
- Student can apply their knowledge of motion systems to design their Mechanical toy.

How is homework used to enhance learning?

Students work from a booklet that includes quiz's, activities, exemplars. Students are provided graded exemplars for most activities. Students are provided assessment criteria's for assessment activities in booklets.

H/W – further research (developing research and extended writing skills) on the Mechanical products.

Students will learn:-

- Develop, communicate, record and justify design ideas using a range of appropriate techniques such as:
- freehand sketching, isometric and perspective
- 2D and 3D drawings
- system and schematic diagrams
- annotated drawings that explain detailed development or the conceptual stages of designing
- Computer based tools
- modelling: working directly with materials and components, eg card modelling, producing a toile when designing garments, constructing a circuit using breadboard.

What does excellence look like?

- Clean straight lines when drawing
- Good contrast between light and dark when shading.
- Rendering and colour is within the assigned areas.
- Can draw medium to complex isometric shapes using the isometric grid.
- Can draw complex shapes in a variety of methods.
- Students can communicate their design ideas effectively.
- Student to draw a net of their design using CAD methods
- Can create working drawing that are accurate and communicate their design ideas effectively.

How is homework used to enhance learning?

Students are provided with exemplar.

Isometric grids

How to guides for 2D design.

How to power points to use the lasercutter.

H/W to design and create origami animals for a selected target market – Assessed on drawing skills and creativity.

Knowledge, understanding & Skills

Effectively model ideas in card to prototype ideas and mechanisms.

Confident lines/ mark making

Smooth shading

Cross sectional shading

Tone

Shade

Faint lines for construction

Thick and thin line techniques

Render to suggest textures and materials.

Can add colour to emphasis shape.

Can add colour to make the shape stand out.

Isometric drawing

Oblique drawing

CAD software – 2D design

Learning 3D software to represent ideas – Google sketchup.

1-point perspective

2 point perspective

Contour lines

Third angle orthographic.

Apply

To apply drawing subject knowledge to successfully design origami animal in a drawing method of their choice.

To apply shading and colour to help communicate design ideas.

How will we assess impact?

- Drawing assessment takes place twice a year
- New assessment booklets to start 2019-20
- Peer assessment
- H/W drawing of Mechanical toy are assessed.

Students will learn:-

Students should know and understand how to evaluate prototypes and be able to:

- reflect critically, responding to feedback when evaluating their own prototypes
- suggest modifications to improve them through inception and manufacture
- assess if prototypes are fit for purpose.

Tolerances

- Work accurately using tolerances.
- How a range of materials are cut, shaped and formed to designated tolerances.
- Why tolerances are applied during making activities.

Specialist tools and equipment

- How to select and use specialist tools and equipment, including hand tools, machinery, digital design and manufacture, appropriate for the material and/or task to complete quality outcomes.
- How to use them safely to protect themselves and others from harm.

Selecting finishes and treatments

- Students should know and understand that surface treatments and finishes are applied for functional and aesthetic purposes.
- How to prepare a material for a treatment or finish.
- How to apply an appropriate surface treatment or finish.

Knowledge, understanding & Skills

Know

- Students will understand how to use:

- Tenon Saw
 - Coping Saw
 - Sand paper – Different grades
 - Disc Sander
 - Electric Sander
 - Pillar Drill
 - Electric cordless drill
 - Line bender / strip heater
 - Wet and dry sand paper
 - Araldite
 - Scroll saw
 - Vice
 - Laser cutter
- How to finish and polish Acrylic
- How to successfully glue Acrylic.

Apply

- To apply an objective analysis of their work in order to improve the overall quality.
- Being able to analyse and evaluate work objectively.
- To apply shading and colour to help communicate design ideas.
- To be able to create a design using 2D software.

What does excellence look like?

- To be able to cut accurate straight lines.
- Can use a coping saw to create smooth curves.
- Can use a scroll saw to create both straight and curved lines.
- Transfer imagery from CAD software to CAM machinery
- Control the depth of drilled holes.
- Able drill holes in the right place.
- Able to cut out their designs using the laser cutter with assistance.
- Highly smooth finish from sanding.
- Using Wet and dry sand paper to smooth and polish plastic.
- Create a fully finished product.
- Detailed objective analysis of prototype_with the ability to modify manufacturing processes to improve.

How is homework used to enhance learning?

- Students are guided through how to use equipment.
- Students are made aware of safety concerns and how to remain safe at all times.
- Students are directed to www.DTStudent.com
- To watch how to guides to further develop their understanding at home.



How will we assess impact? (3D)

Peer and self-assessment
Previous lesson recap quiz
Land mark tasks
End of topic test

International Opportunities

Visits Programmes

Tour of Milan centre – Galleria, Fashion District, Teatro alla Scala etc.
Blanes - Park Güell – architecture, where Gaudí turned his hand to landscape gardening.

Within the curriculum

Term 1: Introduce students to mining of metals and the impact of these on the environment and planet. Look at examples from around the world - Interpret information provided to decide on the suitability/ potential to be sustainable. e.g. Australia. Using examples develop an understanding of how climate and habitats impact the type of renewable energy most suited to a location e.g. UK wind and tidal, Australia solar and the reasons for this. Use case studies from around the world to explore.

Term2: Students given a selection of international designers and movements to explore and research in relation to the chosen theme and project e.g. Eames, Marcel Breuer, Corbusier etc.

Term3: Watch IKEA video of chair design from concept to product.