Engineering

Key Stage 3 Curriculum Overview

Year 7 Steady Hand Game											
Introduction to workshop safety, tools and machinery; use of jigs and templates to manufacture a product.											
Autumn Term Lessons 1-2		**Autumn Term Lessons** 3-5		**Autumn Term Lessons** 6-8		**Spring Term Lessons 9-10**		**Spring - Summer Term Lessons 11-17**		**Summer Term Lesson 18**	
TOPIC TITLE: Health and Safety		**TOPIC TITLE: Analysis and Research/Design ideas**		**TOPIC TITLE: Chosen Design/Final design and planning/ Manufacturing**		**TOPIC TITLE: Manufacturing/Finishing**		**TOPIC TITLE: Electronic Circuit Manufacturing/Finishing**		**TOPIC TITLE: Testing and Evaluation**	
Topics: **Be aware of Health and Safety issues within workshop**	**Domains:** Introduction into equipment used and safety. Identify hazards and safety precautions in a school workshop. Understand the colour coded system: RED, AMBER, GREEN. Understand what PPE means and when it is appropriate to use. Recognise safety/ warning signs. Suggest safety precautions	**Topics:** **Brief** **Analysis** **Research** **Design Ideas**	**Domains:** Understand areas of analysis for a product theme, and know what is the expected, to reach target level. Be aware of design Brief, Specification and outline of project. Identify all areas of a product theme in the form of a thought shower Differentiate between a situation and a brief and identify a design specification. Produce a detailed thought shower working beyond their predicted levels. Write a clear design brief and consider the user's needs. Design ideas – learning how to use a primary source to create first initial design ideas **(AFL)**	**Topics** **Review of ideas (AFL)** **Evaluation of Ideas** **Planning** **Introduction to hand tools and equipment including jigs and template** **Create background and prepare box for circuit** **Introduction to AFL in practical**	**Topics** Learning how to communicate design ideas sufficiently to achieve a high-level using assessment criteria Identify areas for improvement-reflective work Develop a range of success criteria's in the form of a specification to evaluate the background ideas against; complete an evaluation and learn how to communicate decision making through conclusion writing. Complete final design (Planning) including measurements (AFL) Learn how to mark out and cut their chosen design on MDF. (AFL)	**Topics** **Drilling** **Wire bending** **Gluing** **Finishing (smoothing, filling and painting)**	**Domains (Core knowledge and skills)** Learn the term batch production and quality control Understand how to use jigs and templates and know the importance of them when manufacturing in bulk. Identify correct procedures for adhering wood to wood using PVA Identify the material used to make the wire puzzle element (copper) and understand its importance in the circuit (switch)	**Topics** **Introduction to electronics and circuit diagrams; Theory** **Safety using soldering equipment** **Planning for circuit building** **Completion of circuits**	**Domains (Core knowledge and skills)** Learning how to build a working circuit, being able to identify electronic components and draw a circuit diagram (AFL in books) Create a planning sheet in books to then build and solder their own working circuit safely reflecting on health and safety knowledge previously learnt.	**Topics** **Testing and Evaluation**	**Domains (Core knowledge and skills)** Testing and trialling product through a specification and questionnaire Identifying improvements and modifications
Prior Domains: Basic personal safety; no workshop experience from primary school Basic health and safety rules learnt at primary school and maybe at home – when using basic equipment.		Prior Domains: Some students may have a basic knowlede of create a mind map and search for information or images from primary school or at home. Drawing skills aquired from primary school or home.		Prior Domains: Basic rules of how to use hand tools safely, and awareness of saftey in workshop– now to apply those skills during this task. Knowledge from		Prior Domain: Knowledge from home/school – painting on paper that can be applied to painting on MDF/Wood Basic rules of how to use hand tools safely, and awareness of saftey in		Prior Domain: Basic knowledge of how to construct products mainly by hand – to be developed by use of a machine as well as hand techniques.		Prior Domains: Knowledge of how to evaluate products from priamary school.	

		home/school –measuring, drawing and painting skills will be revisited.	workshop– now to apply those skills during this task. Knowledge from home/school –measuring , drawingand painting skills will be revisited.	Basic problrm solving skills. Basic awareness of health and saftey when using equipmenty; reflect on and put learning on workshop saftey to pravtice.	

Year 8 Desk Tidy (Storage)											
Developing independence and creativity; marking out accurately and cutting finger joints before using iterative design process to develop into storage of their choice.											
Autumn Term Lessons 1-3		**Autumn Term Lessons 4 -5**		**Autumn Term Lessons 6-7**		**Spring - Summer Term Lessons 8-12**		**Summer Term Lesson 13-17**		**Summer Term Lessons 18**	
TOPIC TITLE: Analysis and research: Natural timber and manufactured wood		**TOPIC TITLE: Product analysis Design brief and Specification**		**TOPIC TITLE: Marking out and cutting Finger Joints**		**TOPIC TITLE: Drawing Techniques**		**TOPIC TITLE: Customising Design and finishing. (iterative design approach) Making Diary**		**TOPIC TITLE: Testing and Evaluation**	
Topics	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**
Natural Timbers Manufactured Boards	To understand that Natural timber (wood) can be divided into, two categories; Softwood and Hardwood. Learn the characteristics of each category and begin to understand why material knowledge is beneficial as a designer. Understand the difference between, manufactured boards and natural timber; identify some strengths and weaknesses. Students work in teams then transfer knowledge into booklets completing all the questions**.**	**Product Analysis Design Brief Specification**	Understand and apply key words used in DT to help analyse, evaluate and write a detailed specification; ACCESSFFMM- recall and apply learning- written assessment and AFL Understand the importance of a design brief and using research, (reflecting on materials research and product analysis) describe the design criteria for their desk tidy in a specification- assessment piece and AFL	**Joints and Adhesives (homework and book work)** **Marking out MDF** **Quality control and AFL** **Cutting using a Tenon saw** **Cutting using a Coping saw** **Dry assembly and joint testing**	To understand that there are different ways of joining materials Understand how to mark out an accurate finger joint Know how to, accurately cut a finger joint, using a Tenon saw and removing the waste with a coping saw. Understand how to dry assemble and quality control check work as it progresses checking for imperfections and areas to improve. Testing each joint as they are cut before final assembly	**Working drawing** **1 - point perspective technique** **Initial design ideals** **Modelling Testing and evaluation** **Final Design (isometric)**	Understand how to create a working drawing. Know the importance of a working drawing and accurate dimensions. Be able to create interesting initial ideas for a Desk Tidy using rendering and communication skills. To use simple card modelling techniques to test and analyse an idea; be able to judge the best design using an understanding of design brief and specification. Understand how to reflect on the design brief and specification to evaluate each idea critically to make a justified decision and select a suitable design for manufacture Understand the rules of Isometric Projection	**Cutting using a Tenon saw** **Cutting using a Coping saw** **Dry assembly and joint testing** **Joining and clamping** **Smoothing and sanding** **Shaping and modifying** **Recycling and reusing** **Painting and decorating**	Know how to, accurately cut a finger joint, using a Tenon saw and removing the waste with a coping saw. Understand how to dry assemble and quality control check work as it progresses checking for imperfections and areas to improve. Testing each joint as they are cut before final assembly Understand how to reuse and recycle off cuts; developing iterative approach to manufacturing/ Modifying design to meet design ideas. Developing more independence and confidence in using equipment to shape, smooth and drill holes (recapping skills developed in year 7)	**Evaluation**	Testing and trialling product through a range of questions, Identifying improvements and modifications **(AFL)**
Prior Domains: Basic knowledge of woods metal and plastics from year 7 project. Some understanding of natural woods and		Prior Domains: Aware of design brief and specification from year 7 project.		Prior Domains: Homework on joints Recall knowledge from year 7 (including homework)		Prior Domain: Communication of ideas in year 7 project; steady hand game		Prior Domain: Basic knowledge from year 7; cutting shaping and workig with natural wood and MDF		Prior Domain: Basic evaluation in year 7; evaluation and reflection across all DT subjects.	

where they might come from, from primary school learning, geography, science and home learning. Aware of products made from wood.	Will have used ACCESSFMM to evaluate and write a specification in other DT subjects- recall knowledge and apply.	Health and safety considerations in the workshop. Knowledge of marking out equiepment and use of jigs and templates from year 7. Will be able to convert CM to MM to read a steel rule learnt in year 7. Knowlegde of how to use a coping saw and tenon saw; recall and reapply to this joint (no jigs or templates)	Planning drawing in year 7 (working drawing) Basic drawing skillis in Graphics DT in year 7	Use of PVA wood glue Awareness of H&S considerations; apply in workshop	

Year 9 Picture Wooden Frame/ Mirror											
Challenge and independence; accurately marking out and cutting a range of joints (including those developed in 7 and 8)											
Lessons 1-3		**Lessons 4-6**		**Lesson 7**		**Lessons 8-9**		**Lessons 10-16**		**Lessons 17-18**	
TOPIC TITLE: Analysis and research		**TOPIC TITLE: Design Ideas and Evaluation**		**TOPIC TITLE: Planning**		**TOPIC TITLE: Marking out of material and cutting**		**TOPIC TITLE: Manufacture and Assembly**		**TOPIC TITLE: Making Diary and Evaluation**	
Topics	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**
Photo Frame Analysis **Users and their needs**	Analysing products to determine whom a product is targeted at; reflecting on considerations designers need to make in order to create a successful product. Learning how to make connections between material choice and function etc.- reflecting upon knowledge of ACCESSFMM Develop a detailed understanding of the needs of a Manufacturer, retailer and consumer, to help them become effective designers. (AFL)	**Design ideas and communication (AFL)** **Evaluation of designs** **Chosen design (homework)**	Develop a range of ideas, including shape and decoration for their photo frames. Reflective work considering needs of their chosen user and client profile. Templates provided to work from in books. (AFL) Students learn to write and detailed analysis of ideas against a specification and client needs; assessment based on student's ability to discuss how each design meets the needs of their chosen user and the specification.	**Working Drawings** **Accurate Dimensions** **Quality Control**	Learning how to read a dimension drawing and transfer measurements over to exploded parts; identifying parts of the frame and labelling the joints. Understanding the importance of accurate measurements and working drawings be able to discuss quality control and apply this to their practical work.	**Marking out** **Cutting** **Quality Control** **Intro to joints**	Reflecting on prior knowledge of workshop safety independently or in pairs accurately mark out a length of softwood ready to cut out into 4 specific lengths. Recalling correct methods for marking out. Learning how to cut a length of wood with the correct equipment and then disc sand to correct length. Identifying the importance of limiting waste Independently use learning mats to manufacture mitre joint using a jig.	**Mitre Joint** **Finger Joint** **Halving Joint** **Dovetail joint** **Shaping /Finishing**	Students will receive a detailed demonstration of safety, marking out and cutting of each of the joints specified in the photo frame. One joint each lesson. Students will then need to apply this knowledge independent to produce their own joint. They may refer to learning mats provided for each joint. (AFL) Challenged and independent learning. Once completed they can then begin to develop design to complete their frame; reflecting on prior knowledge of tools and equipment made available to them. All will have a completed frame, most will have 4 joints and some shape attempted, and some will have a unique design and may have incorporated CAD	**Evaluation**	Testing and trialling product through a questionnaire Identifying improvements and modifications Reflection of learning outcomes and progress- written evaluation- AFL

													work or included a stand for the frame.						
Prior Domains: Mind mapping in years 7 and 8; understanding of ACCESSFMM Key words and application in DT. Basic undertsanding of design cylcle; designer, manufacturer, retailer, consumer.		Prior Domains: Some knowledge of how to use primary source images to create a wide range of ideas. Students will have used mainly pencil, pen and crayons to add colour to their designs in Years 7 and 8. They will have some understanding of Basic CAD design using 2D design, recalled, and then applied. Ability to evaluate and suggest improvements; specification completed using ACESSFMM		Prior Domain: Knowledge of dimesions; use of planning and basic wokring drawings in years 7 and 8. Homework on quality control		Prior Domain: Health and Safety practices in the workshop. Use of basic hand tools for marking out and cutting. Homework on quality control Conversion of measurements		Prior Domain: Health and Safety practices in the workshop. Use of basic hand tools for cutting and shaping. Knowledge of Mitre joint and finger joint from year 7 and 8. Homework on quality control and joints Conversion and understanding of measurements and dimensions. Planning lesson- working drawing Chosen idea homework		Prior Domains: Evaluation techniques used across DT subjects from year 7-9. AFL throughout practical work.	

<u>Key Stage 4 Curriculum Overview</u>

Year 10 OCR Cambridge National: Engineering Design Level 2											
Autumn Term 1A September- November		**Autumn Term 1B December- January**		**Spring Term 2A February- March**		**Spring Term 2B April- May**		**Summer Term 3A May-June**		**Summer Term 3B June-July**	
TOPIC TITLE: Core Knowledge: Unit RO38- Examination Unit Theory		**TOPIC TITLE: Controlled Assessment:** Unit RO39 - Communicating Designs		**TOPIC TITLE: Controlled Assessment:** Unit RO39- Communicating Designs		**TOPIC TITLE: Core Knowledge & Controlled Assessment:** Unit RO38- Examination Unit Theory Unit RO39- Communicating Designs		**TOPIC TITLE: Core Knowledge:** Unit RO38- Examination Unit Theory		**TOPIC TITLE: Core Knowledge:** Unit RO38- Examination Unit Theory	
Topics Introduction to Units. Base line examination. Core knowledge for **RO38**: Designing processes; stages and strategies, cyclic approach	**Domains (Core knowledge and skills)** **<u>Principles of Engineering Design</u>** (RO38) **TA1** Focus on design strategies/processes including exam style questions. **TA1 Linear Design.** Linking to inclusive design. **TA1 Inclusive Design** Advantages and disadvantages, exploring different strategies. **TA1 User Centred Design** Summarising the key aspects. **TA1 Sustainable Design** Linking with and exploring ergonomics and iterative design. Links to RO39 TA1 /RO40 Iterative design **TA1 Design Briefs** Recap iterative design and the Design cycle,	**Topics** **RO39** Communicating Designs.	**Controlled Assessment:** **TA1 Manual production of freehand sketches** Links to KS3 design ideas legacy. Providing a range of sketches in both 2- and 3-dimensions following techniques learnt in RO38. **TA1 One- and two-point perspective** – generating ideas using these techniques. **TA1 Hue, Shade & tone** Specify direction of light, identifying parts based on light source – applying to previous sketches. Links to RO38 TA3 working drawings **TA1 Texture & Pressure** Render cubes using outline, texture,	**Topics** **RO39** Communicating Designs.	**Controlled Assessment:** **TA1 Tolerance and Scale** Technical drawing skills used as reference to explain dimension, tolerance, diameter and scale. Links to RO38 TA3 working drawings **TA2 Manual production of freehand sketches Design Development** TA2 Recall Isometric Drawing convention Links to RO38 TA3 design outcomes Use industry standards and technical drawing skills. Students are to embed existing knowledge into their report for RO39 on freehand sketches. Draft sketch a range of concepts suitable for developing into	**Topics** **RO39** Communicating Designs. **RO38**: Sketching and drawing, CAD **RO39**	**Controlled Assessment:** TA2 Students will be able to complete an exploded view of an isometric drawing. Links to RO38 TA3 working drawings TA2 Produce an assembly drawing for a design proposal, generating a parts list, referencing parts against the proposal. Links to RO38 TA3 working drawings **TA3 Sketching and drawing, CAD** Identify drawing abbreviations Across flats, centre line, diameter, material, square Links to RO39 TA2 Engineering Drawings Identify mechanical features: threads, holes, chamfers, countersinks and Knurls Links to RO39 TA2 Engineering Drawings	**Topics** **RO38**: Designing processes; stages and strategies, cyclic approach	**Domains (Core knowledge and skills** **TA1 Cyclic approach to Design.** Iterative design, methods of research, primary, secondary, interviews and focus groups Advantages and disadvantages of a range of methods – market research and interviews. Links to RO40 analyse a product **TA1 Ergonomics & Anthropometric Data** Introduction into topic using examples and application of, to determines product dimensions and geometry. **TA1 Investigate existing products** Recall ACCESSFM, to investigate how products are analysed through safe disassembly (more detail in RO40) using a case study **TA1 Design Phase**	**Topics** Core knowledge for **RO38:** Examination Unit Theory Core knowledge for **RO38:** Examination Unit Theory	**Domains (Core knowledge and skills)** Introduction to 3d extrusion and different ways of generating shapes, hollows etc Market pull, technology push, examples and summarise Legislation, What it is, what it means, the significance to product design and the relationship with standards. Links to RO40 TA1 product evaluation British and International standards. How they inform product design. Planned obsolescence Links to RO40 TA1 Product evaluation 6R's sustainable design features, relating to a product Links to RO40 TA1 Product Evaluation

	identify, design, optimise and validate. Focus on Identify considering the contents of the design brief. Links to RO39 TA1 /RO40 analyse a design brief Learn how to analyse a design brief using the information learnt through theory lessons and independent research. Links to RO40 Iterative design		pressure using various mediums. Links to RO38 TA3 working drawings **TA1 Annotation & Labels** specification, form, function & feature ensure all are understood and the differences explained		required specification product **TA2 Manual production of Engineering Drawings** TA2 students will be able to identify a sectional view, read a sectional drawing and understand convention. Links to RO38 TA3 design outcomes	Communicating Designs.	**TA3 Use of Computer aided design (CAD)** TA3: Produce a 3D CAD model of a design proposal to include compound 3D shapes. **Submission May/June** Students are required to produce a 2d technical drawing of a shape with dimensions provided, using circles lines and arcs.		Design Requirements. Specification, focus on linking to generating design ideas. Links to RO40 product disassembly **TA1 Designing Processes** Generating design ideas against a specification – second phase of Design cycle – Design. Links to RO39 design sketches		Design for the circular economy, the importance on the design of products
Prior Domains: Subject Knowledge from DT in KS3 Design process-cyclic design and key words e.g. sustainability.		**Prior Domains:** Subject Knowledge from DT in KS3/ RO38 Design process- Freehand sketches and key words e.g. perspective.		**Prior Domains:** Subject Knowledge from DT in KS3/RO38 Art and design drawing skills Graphics work. Use of 2d design and simple cad work Used working drawings in Y9 for manufacturing.		**Prior Domains:** Subject Knowledge from DT in KS3 /RO38 Art and design drawing skills Graphics work. Use of 2d design and simple cad work Used working drawings in Y9 for manufacturing.		**Prior Domains:** Subject Knowledge from DT in KS3. RO38 knowledge.		**Prior Domains:** Subject Knowledge from DT in KS3. FPT completed to date to consolidate learning and develop skills- RO38 knowledge.	

Year 11 OCR Cambridge National: Engineering Design Level 2											
Autumn Term 1A September - November		**Autumn Term 1B December - January**		**Spring Term 2A February - March**		**Spring Term 2B April - May**		**Summer Term 3A May - June**		**Summer Term 3B June - July**	
TOPIC TITLE: Core Knowledge: Unit RO38- Examination Unit Theory		**TOPIC TITLE: Controlled Assessment:** Unit RO38- Examination Unit Theory Unit RO40 – Design, evaluation and Modelling		**TOPIC TITLE: Controlled Assessment** Unit RO38- Examination Unit Theory Unit RO40 – Design, evaluation and Modelling		**TOPIC TITLE: Theory Revision** Unit RO38- Examination Unit Theory		**TOPIC TITLE: Theory Revision & Examination**		**Students Not present**	
Topics	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**	**Topics**	**Domains (Core knowledge and skills)**
RO38: Core Knowledge Examination Unit Theory .	**Virtual and Physical Modelling**. TA1 Purposes and reasons for virtual and physical modelling, examples for evaluation compliment and links to RO40 TA2 physical prototyping TA4 Design requirements of virtual 3D CAD. Advantages and disadvantages. TA4 Modelling methods, use of card and other materials, to analyse the limitations of different materials links to RO40 TA2 physical prototyping	**RO38:** Core Knowledge Examination Unit Theory **RO40** Design, evaluation and modelling	TA4 User testing and design modifications and improvements TA2 Wasting, focus on manufacturing processes, joining methods etc. in detail. links to RO40 TA2 physical prototyping **TA1 Product Evaluation** Using primary and secondary research to evaluate existing products, ranking and analysing for QFD. Links to RO38 TA2 Principles of Engineering Design	**RO40** Design, evaluation and modelling	TA2 Physical modelling, produce a physical prototype, using a variety of methods additive engineering, subtractive manufacture Links to RO38 TA2 Principles of Engineering Design TA2 production of risk assessments, identification of hazards and safe working practices and procedures TA2 Evaluation of manufactured prototype against the	**RO40** Design, evaluation and modelling **RO38:** Core Knowledge Examination Unit Theory	**Submission May/June** **TA1 Revision** Recall design strategies, including stages involved Revisit key stages of iterative design process Practice examination **TA3 Revision** Types of engineering drawings used. Key features of orthographic drawings Practice examination	**RO38:** Core Knowledge Examination Unit Theory	**TA4 Revision** Design against brief, measuring equipment, user testing Practice examination Examination		

	TA1 Prototyping – use of in the iterative design process links to RO40 TA2 physical prototyping TA4 Compare products using ranking matrices links to RO40 TA1 physical prototyping **TA4 Evaluating Design Ideas** QFD Quality function deployment Evaluating Design outcome against specification links to RO40 physical prototyping		**TA2 Product disassembly** Carry out a product disassembly, identify correct tools and methods to undertake the process, identify measuring tools to extract data (size/weight), types of processes and material properties **TA2 Methods of Modelling** Producing a plan of manufacture for an engineering design. Virtual CAD modelling, produce a suitable working drawing Links to RO38 TA2 Principles of Engineering Design	**RO38:** Core Knowledge Examination Unit Theory	specification Links to RO38 TA2 Principles of Engineering Design TA2 Design Requirements, finishing and assembly: deburring, coatings etc. TA2 Production costs, labour, capital, solving simple production cost issues		**TA2 Revision** Qualitative and quantitative criteria recap ACCESSFM Market pull/technology push, legislation and standards, planned obsolescence and sustainable design Practice examination **TA4 Revision** Purpose of production of models, comparisons with design briefs and ranking matrices				
Prior Domains: Evaluation techniques used across DT subjects from year 7-9. AFL throughout practical work. Mock examanations, exam style homeworks and RO38 theory lessons in year 10.		**Prior Domains:** Mock examanations, exam style homeworks and RO38 theory lessons in year 10 **.**		**Prior Domains:** Subject Knowledge from DT in KS3. RO38 knowledge. RO39 knowledge. RO40 knowledge.		**Prior Domains:** Subject Knowledge from DT in KS3. RO38 knowledge.		**Prior Domains:** Subject Knowledge from DT in KS3. RO38 knowledge.			