

Curriculum Progression Maps

TECHNOLOGY – KS3 and 4 Engineering



ENGINEERING					
	Year 7	Year 8	Year 9	Year 10	Year 11
Autumn 1 and 2	<p>9 lesson rotation on carousel which runs throughout first full term.</p> <p>Will be a chosen material choice – either pine or acrylic depending on workshop space available with amount of groups running at one time. Project will cover same skills eg cutting, finishing, joining.</p> <p><u>Book End Project (pine)</u></p> <ul style="list-style-type: none"> •lesson 1 – H&S introduction and design brief/specification/design ideas *HW – client/user needs linking to specification points. •lesson 2 – marking out and cutting. •lesson 3 – cutting with a tenon saw and rapid sanding. *HW – properties of materials – key words. •lesson 4 – cutting with a coping saw and pillar drill to drill dowel joint with use of depth stop. Use of jig linking to scales of production. •lesson 5 – achieving a good quality of finish on sides with a hand file and use of pillar drill focus with use of depth stop. Use of dowel markers. *Hw – categories and properties of materials linking to timber and plastics. 	<p>9 lesson rotation on carousel. Which runs throughout first full term.</p> <p><u>Pewter Project (metal and use of cad)</u></p> <ul style="list-style-type: none"> •lesson 1 – the design problem, brief and specification *HW – client/user needs linking to producing specification points. •lesson 2 – producing a range of design ideas meeting a chosen theme. Rendering ideas. •lesson 3 – using CAD for drawing of first section of three part mould *HW – properties of metals. •lesson 4 – checking accuracy of drawing resizing of drawing to fit limitations of mould size. 	<p><u>Term 1 – Coat Hook Project.</u></p> <p><u>Theory linking to coat hook project (Feeds into R105-8)</u></p> <ul style="list-style-type: none"> •Describing the properties of materials •Material Types and properties covering range of material areas. •Environmental considerations of material choices •Stock forms of materials for how products are sold in various shapes and sizes. •Scales of production for manufacturing products in different amounts – industry methods used for each scale of production. •Industrial/manufacturing processes used to manufacture products in large/identical quantities – including use of CAD CAM. •Standard components used to help manufacture products – eg screw types, rivets. •Tolerances when manufacturing products to ensure consistency and quality. Including quality control to achieve accuracy and consistency in products. •Revisiting of topics from Autumn Term built into lessons – starter activities, homeworks set. •End of topic test/ revisiting to improve areas of weakness. •Exam question practice from OCR papers built into theory lessons as well as homework set. <p><u>Practical Content: (Feeds into R108)</u></p>	<p><u>Coursework 1 Unit R106</u></p> <p>Product analysis and research <u>(Coursework 1) – bike light project.</u></p> <ul style="list-style-type: none"> •Researching existing products •Researching scales of production •Researching manufacturing processes •End of lifecycle and the 6RS •Product disposal and relevant symbols. •Legislation •Product Analysis •Product Disassembly and write up •Risk Assessment <p><u>Theory.</u></p> <p>1 lesson per week.</p> <p>-Revisiting of topics from year 9.</p> <p>-Exam question practice to form assessment opportunities.</p>	<p><u>Coursework 3 Unit R108</u></p> <p>1) LO1 – Learners will use their designs to produce a plan of production for the model in the form of charts, tables, identifying stages of making and resources required.</p> <p>2) LO2 – Learners will demonstrate their knowledge and understanding of using tools, equipment and materials safely, assessing hazards and taking precautions when using tools and machines. Through observation in a workshop setting and through recording risks in the production process as part of the plan of making/production, learners will demonstrate safe working practices during the making of a prototype.</p> <p><u>Theory.</u></p> <p>1 lesson per week.</p> <p>-Revisiting of topics from year 10.</p> <p>-Exam question practice to form assessment opportunities.</p>

	<p>●lesson 6 - achieving a good quality of finish – use of abrasive papers focus.</p> <p>●Lesson 7 – adding a finish focus – painting the animal. *HW – use of finishes on materials for aestical or functional reasons.</p> <p>Lesson 8 – Assembling focus and use of adhesives. Marking out and cutting of dowel joints. Focus on accuracy and checking quality of finish achieved on work.</p> <p>Lesson 9 – Testing and evaluation. *HW – environmental issues of materials selected</p> <p>Puzzle Project (acrylic)</p> <p>●lesson 1 – H&S introduction and specification/design ideas *HW – client/user needs linking to specification points.</p> <p>●lesson 2 – shaping using a hand file.</p> <p>●lesson 3 – achieving a good quality of finish using abrasive papers *HW – properties of materials – key words.</p> <p>●lesson 4 – use of heat to shape using a heat strip. Use of jig linking to scales of production.</p> <p>●lesson 5 – cutting using a junior hacksaw. *Hw – categories and properties of materials.</p> <p>●lesson 6 - file to fit and checking for accuracy on lid. drilling and use of depth stop.</p>	<p>●lesson 5 – drawing of final sections of three part mould. Covering use of red and black lines linking to use of CAD. *HW – product analysis task looking at others work to inspire.</p> <p>●lesson 6 – workshop focus. Cutting off funnel with a junior hacksaw and use of a hand file linking to achieving a good quality of finish.</p> <p>●lesson 7 – use of centre punch, hammer and pillar drill to drill required hole. *HW – influence of cultures on ideas</p> <p>●lesson 8 – achieving a good quality of finish focus and continuation of pillar drill. Use of metal polishes as finishes for aesthetical reasons.</p> <p>●lesson 9 – testing and evaluation.</p>	<p>●Design Ideas produced using CAD – recapping and building on basic 2d Design skills learnt in year 8 (menu buttons etc).</p> <p>●Design Ideas produced by hand – 2D and 3D in isometric.</p> <p>●Engineering Plans produced using CAD (isometric and orthographic)– building on 2D design skills beyond an orthogonal grid and learning to draw in isometric also using CAD software.</p> <p>●Health and safety awareness development – recap and building awareness linking to previous learning as well as with new tools and equipment introduced also.</p> <p>●Cutting metals – hacksaw</p> <p>●Marking our sheet metal – engineers blue, scribe, odd leg callipers, dividers. Focus on achieving accuracy in measurements. Use of peer assessment and teacher assessment to help achieve this.</p> <p>●Shaping metals – cutting and filing to shape.</p> <p>●Checking for accuracy in work – if working to markings out. Spotting areas for improvement more independently.</p> <p>●Pillar drill/countersinking. How to set up a pillar drill safely and correctly to drill metal. How to centre punch work to enable drilling (recap from year 8).</p> <p>●Heat treatments to bend metals more easily – brazing hearth to heat and bend aluminium.</p> <p>●Use of hand file and abrasive papers to achieve a good quality of finish – emery cloth and wet and dry.</p> <p>●Use of rivets to join metals – ball hammer and hacksaw.</p>		
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	<p>•Lesson 7 – checking quality of finish and producing final design for the centre on card. drilling and use of depth stop *HW – use of finishes on materials for aesthical or functional reasons.</p> <p>Lesson 8 – Assembling focus and use of adhesives. *HW – environmental issues of materials selected</p> <p>Lesson 9 – Testing and evaluation.</p>	<p>HW – environmental issues linking to use of metals.</p>			
Spring 1 and 2	---	---	<p>Term 2 - Project Change. – balancing toy – lathe/brazing hearth to form permanent joints in metals. Modelling ideas before making linking to R107 unit.</p> <p>Theory content:</p> <ul style="list-style-type: none"> • The Engineering Design Cycle • Human Factors in designing • Ergonomics and anthropometrics • User needs • People, society and culture • Market Pull and Technological push. • Product Evolution • Iconic Products • Life cycle assessments including 6RS. • Regulations, safeguards and Standards inc 	<p>1) Completion of Coursework 1.</p> <ul style="list-style-type: none"> •Product Disassembly and write up •Risk Assessment <p>2) Coursework 2 : R107 speaker design <i>Developing and presenting engineering designs</i></p> <p><i>LO1 completion – generate design proposals using a range of 2d and 3d techniques</i></p> <p><i>-drawing a range of ideas by hand</i></p>	<p>January – 1st attempt at R105 written examination</p> <p>Continuation of R108 coursework</p> <p>3) LO3 – Learners will apply their design to produce a quality model outcome demonstrating thorough design, planning and making, using resources effectively and efficiently.</p> <p>4) LO4 – Learners will evaluate and identify how well their design and subsequent model outcome meets the specification, identify and</p>



			<ul style="list-style-type: none"> • Consumer Protection Laws • Copyright, Patents and Trademarks • British and EU Standards • Health and Safety • Product Requirements • Function and features • Limitations and Constraints • Working Environment • Product Performance • Manufacturing Considerations Inc Durability and maintenance Supply chains Cost and budget Materials and components. Product Disposal • Risk Assessment <ul style="list-style-type: none"> • Revisiting of topics from Spring Term built into lessons – starter activities, homeworks set. • End of topic test/ revisiting to improve areas of weakness. • Exam question practice from OCR papers built into theory lessons as well as homework set. • Recapping of key topic areas – run throughs linking to exam practice. • Revisiting of topics from Autumn Term built into lessons – starter activities, homeworks set. • End of topic test/ revisiting to improve areas of weakness. • Exam question practice from OCR 	<p><i>-enriching ideas through use of 2d to show features</i> <i>-labelling ideas through use of ICT</i> <i>-annotating ideas through use of ict.</i></p> <p>Theory.</p> <p>1 lesson per week.</p> <p>-Revisiting of topics from year 9.</p> <p>-Exam question practice to form assessment opportunities.</p>	<p>recommend improvements. Learners will record these in a portfolio/ folder or PowerPoint presentation.</p> <p>Theory.</p> <p>1 lesson per week.</p> <p>-Revisiting of topics from year 10.</p> <p>-Exam question practice to form assessment opportunities.</p>
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papers built into theory lessons as well as homework set.

Practical content (feeds into R107 and 8 units):

- Ideas generated by hand and CAD (refresher/development from first term). 2D design recapped. Fusion 360 Introduced – 3D software.
- Modelling ideas – Styrofoam modelling and applying a finish to create a realistic mock up or prototype inc other modelling materials – card etc.
- Cutting timber (base)
- Shaping timer (belt sander, removing waste material using a file or saw).
- Sanding to help achieve a good quality of finish.
- Applying a protective finish to timber – wax.
- Cutting metals – hacksaw.
- Lathe work to cut and face off material (to produce the weights).
- Using the centre drill on the lathe to drill holes into the weights.
- Brazing hearth to join metals.
- Achieving a good quality of finish on metals (recap/building from coat hook)
- Applying a finish to metals (spray paint)
- Producing acrylic (cutting and engraving) using CAD CAM

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<p>Summer 1 and 2</p>	<p>---</p>	<p>---</p>	<p>Fixperts mini project – designing a product to help users with disabilities – eg small gadget to open a bottle top or remove a plug from a wall. (mock of Unit R107 and 8 which will be completed in year 10/early 11). Combines practical and theory covered to date as part of the project.</p> <ul style="list-style-type: none"> • Product Analysis and disassembly to inform ideas • Putting the engineering design cycle into practice – research, design, model, make and evaluate. • Research- understanding the problem given through investigation/existing products/product disassembly/client information • Producing ideas by hand (2D and in isometric) • 2D Design and Fusion 360 modelling to develop idea (using CAD) • Producing an engineering plan of product to be made using CAD – fusion 360. • Modelling the idea to produce a mock up/prototype (Styrofoam, finishing, painting) • Testing and Evaluation <p>Theory – Recapping and revisiting of previous topics covered in term 1 and 2. Mini in class assessment tasks linking to this.</p>	<p>Coursework Continuation of R107:</p> <p>1) LO2 completion- Developing designs using engineering drawing techniques and annotation through hand drawn and use of CAD.</p> <ul style="list-style-type: none"> - Use of labelling and annotation through use of ICT. <p>2) L03 completion Use of CAD software and techniques to produce and communicate design proposals</p> <p>Theory.</p> <p>1 lesson per week.</p> <p>-Revisiting of topics from year 9.</p> <p>-Exam question practice to form assessment opportunities.</p>	<p>Completion of R108 Coursework areas</p> <p>Exam resit preparation</p> <p>June – 2nd resit of exam if required.</p>
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ENGINEERING KEY VOCABULARY

	Year 7	Year 8	Year 9	Year 10	Year 11
Autumn 1	<p>Book End Project</p> <p>Client User Design Brief Design Specification Design Ideas Material Pine Properties Softwood Hardwood Vice Coping saw Hand file Different grades of sand paper Belt sander Pillar drill Depth stop Jig Tenon saw Bench Hook Dowel stick PVA glue Paint brush/paint Finish Quality of finish Accuracy/accuracy Environmental issues</p> <p>Puzzle Project</p> <p>Client User Design Brief Design Specification Design Ideas Material Acrylic Properties</p>	<p>Pewter project</p> <p>Client User Design Brief Design Specification Design Ideas Material Pewter Ferrous Metal Non Ferrous Metal Alloy Vice Junior hack saw Hand file / filing Abrasive papers – emery cloth and wet and dry paper mark free/scratch free/ hand file marks pillar drill Drilling a hole Centre punch Hammer 2D design/ laser cutter/ Mould Pewter casting machine Good quality of finish Accuracy/accurate/accuracy Environmental issues Product Analysis</p>	<p>Theory</p> <p>Product Manufacturing Processes Materials Properties Environmental Issues Stock Forms Scales of production Identical Quantities CAD (computer aided design) CAM (computer aided manufacture) Standard components Tolerances</p> <p>Practical</p> <p>Design Ideas 2D Design Computer aided design Isometric Orthographic Hacksaw Engineers Blue Scriber Odd led callipers Dividers Aluminium Accuracy Measurement Hand File Pillar Drill Depth Stop Counter Sink Rivets Ball hammer Brazing Hearth Abrasive paper Wet and dry paper Emery cloth Good quality of finish</p>	<p>R106</p> <p>-Strengths -Weaknesses -Existing product -primary research -secondary research -disassembly -components -assembly -materials -production methods -maintenance -consideration -impact -commercial production - manufacturing processes -end of life consideration -legislation -standards</p>	<p>R108</p> <p>-product specification -requirements -processes -production plan -3D prototype -model -materials -card -foam -foam board -plastic -metal -wood -finishes -solvents -component parts -cutting list - planning tools -gannt chart -flow chart -table -manufacture -preparation -assembly -methods -tools -hand tools -equipment -marking out Cutting -CAD/CAM -bending -wasting -moulding -rapid prototype -jigs -formers -templates</p>

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	<p>Thermoplastic Thermosetting plastic Vice Junior hack saw Hand file abrasive papers Pillar drill Depth stop Jig Emery cloth/Wet and dry paper Liquid cement Paint brush Finish Quality of finish Accuracy/accuracy Ball bearings Environmental issues</p>				<p>-patterns -moulds -adhesives -temporary fixing -permanent fixing -safety -risk assessment -production activities -hazards -precautions -machines -process -procedures -PPE -recording -production diary -photograph -production</p>
Spring 1 and 2			<p>Theory</p> <ul style="list-style-type: none"> • The Engineering Design Cycle • Human Factors • Ergonomics • anthropometrics • User needs • society and culture • Market Pull • Technological push. • Product Evolution • Iconic Products • Life cycle assessments • The 6RS. • Regulations • Safeguards • Standards • Consumer Protection Laws • Copyright, Patents and Trademarks • Health and Safety • Product Requirements 	<p>R107</p> <p>-design specification -initial ideas -2D drawing -3D drawing -isometric -orthographic drawing -exploded drawing -sectional view -computer aided design -2d design -rendering -shade -tone -texture -IT -dimensions -key features -industry standards -materials</p>	<p>-manufacture -preparation -assembly -methods -tools -hand tools -equipment -marking out Cutting -CAD/CAM -bending -wasting -moulding -rapid prototype -jigs -formers -templates -patterns -moulds -adhesives -temporary fixing -permanent fixing -safety</p>

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			<ul style="list-style-type: none"> • Function • features • Limitations and Constraints • Working Environment • Product Performance • Manufacturing Considerations • Durability • Maintenance • Disassembly • Supply chains • Cost and budget • Materials • components. • Risk Assessment <p style="background-color: yellow;">Linking to lesson practical</p> <ul style="list-style-type: none"> • <u>CAD</u> • <u>2D design</u> • <u>Fusion 360</u> • <u>Computer software</u> • <u>Modelling</u> • <u>Card</u> • <u>Styrofoam</u> • <u>finish</u> • <u>timber (base)</u> • <u>Shaping</u> • <u>removing waste material</u> • <u>Sanding</u> • <u>achieve a good quality of finish.</u> • <u>Cutting</u> • <u>Lathe</u> • <u>cut and face off material</u> • <u>Using the centre drill on the lathe</u> • <u>Brazing hearth</u> • <u>Applying a finish to metal</u> • <u>Acrylic</u> • <u>CAD CAM</u> 	<ul style="list-style-type: none"> - manufacturing methods -IT 	<ul style="list-style-type: none"> -risk assessment -production activities -hazards -precautions -machines -process -procedures -PPE -recording -production diary -photograph -production -3D prototype -model -materials -card -foam -foam board -plastic -metal -wood -finishes -solvents -component parts -cutting list - planning - technical difficulty -solution -testing -evaluation -strengths -weaknesses -comparison -product specification -improvement -features -function -materials -aesthetics -ergonomics -modelling -process -alternative - manufacturing
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					<ul style="list-style-type: none"> -management -precision -accuracy -quality -outcome
Summer 1 and 2			<ul style="list-style-type: none"> • Client • User • Target market • Inclusive Designs • Disabilities • Product Analysis • Product disassembly • Inform Ideas • engineering design cycle • Research-investigation/existing products/product disassembly/client information • Isometric • Rendering • Development • CAD (Computer aided design) • Modelling • (Styrofoam, finishing, painting) • Testing and Evaluation 	R107 <ul style="list-style-type: none"> -design specification -initial ideas -2D drawing -3D drawing -isometric -orthographic drawing -exploded drawing -sectional view -computer aided design -2d design -rendering -shade -tone -texture -IT -dimensions -key features -industry standards -materials - manufacturing methods -IT 	

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