A Level Scheme of Work

Linear

A Level Design and Technology

Pearson Edexcel Level 3 Advanced GCE in Design and Technology (Product Design) (9DT0)

Contents

A Level Design and Technology 2017: Scheme of Work

Introduction

This document provides a sample scheme of work for teaching A Level Design and Technology that can be adapted by centres to fit their timetabling and staffing arrangements. It is meant as an example approach only and is not intended to be prescriptive.

This scheme of work matches the course planner and broadly follows the order in which the content is set out in the specification. (An A level course planner is provided separately that integrates the themes across the specification and is a suggested approach for those intending not to co-teach the AS level qualification.)

The suggested resources at times are specific but they are intended to demonstrate the type of resources which can be found on the internet. References have not been made to specific textbooks.

This scheme of work is based upon a two-year course for the teaching of the full A level, with examinations taking place in year 2 only and coursework submitted for A level at the end of year 2. The projects suggested in year 1 of the course are intended to support the teaching of skills and give experience of the practical application of the theory being taught. These projects are not assessed as any part or full submission of the NEA. The scheme is based around a course that has four lessons/week, each week structured into blocks that could be divided/redesigned to reflect the centre needs. This is an example of how it could be taught. Suggested projects are just that, suggestions. Individual centre facilities and interests should be taken into account when designing these mini projects or practical tasks.

Year 12 Autumn term

Week	Subject Content Topic	Subject Content (50% of teaching time)	NEA connected activities (50% of teaching time)
1	1.1 Hardwoods/ Softwoods	Students must be able to apply a knowledge and understanding of working properties, characteristics, applications, advantages and disadvantages of the following types of materials to discriminate between them and select appropriately. Woods: a) hardwoods – Oak, Mahogany, Beech, Jelutong, Balsa b) softwoods – pine, cedar, larch, redwood. http://www.diffen.com/difference/Hardwood_vs_Softwood	Explain the use of media to convey design decisions, to record to recognised standards, explain and communicate information and ideas using the following methods and techniques: a) pictorial drawing methods for representing 3D forms – isometric.  **INPUT:** Use this technique to draw a product related to the intended focused practical task, in this case a table lamp. Start with orthographic drawings of the product to be made and use these to gain information to convert the drawing to a sketch. Then demonstrate formal isometric drawing.
	3.1 Processes techniques and specialist tools	Processes, applications, characteristics, advantages and disadvantages of the following, to discriminate between them and select appropriately, including the selection of specific and relevant tools to be used for domestic, commercial and industrial products and systems, and use safely when experimenting, improving and refining in order to realise a design: h) marking out techniques – woods, metals, polymers, paper and boards (including use of specialist tools). https://davidneat.wordpress.com/2014/01/31/tools-for-measuring-and-marking-out/	**FPT (focused practical task)** This time is dedicated to the teaching and application of practical skills – manufacturing the lamp. The submission of a short presentation booklet will accompany the lamp for final marking, which could include work that relates to the drawing techniques being taught in these lessons – final presentation of lamp, exploded views, component drawings, sketches of jigs, schematic drawings for electronic components. **INPUT:** Focus on the application of the metal marking out tools; demonstrate the use of odd leg callipers, scriber, centre punch in marking out the sheet metal shade, in preparation for drilling and shaping.

Week	Subject Content Topic	Subject Content (50% of teaching time)	NEA connected activities (50% of teaching time)
		Application of specialist measuring tools and equipment to determine and apply the accuracy and precision required for products to perform as intended. a) marking, cutting and mortise gauges b) odd leg, internal and external callipers c) squares (set, try, engineers and mitre) d) micrometer and vernier callipers e) densitometer f) dividers g) jigs and fixtures h) go and no-go gauges https://ict2011dnt.wordpress.com/working-with-materials/marking-out-and-measuring-materials/	Time may be available for the use of the centre lathe for facing off tasks – spacer tubes (to fixed length) and the main body.
2	3.3a/3.3b Additional specification content	Composites a) composites – manufactured board, Medium Density Fibre Board (MDF), hardboard, chipboard, plywood. https://dtengineeringteaching.org.uk/2016/02/23/materials-and-components-composites/	a) pictorial drawing methods for representing 3D forms: two-point perspective **INPUT:** The lamp itself is a difficult product to draw in two-point. Also the lamp has already been drawn in 3D using isometric, so it may be more useful to draw the body of the lamp, exploding the lid so the construction detail of the lid switch connector is clearly shown. This is likely to be as a demonstrated task that is followed by the students – extension work would perhaps be exploding the shade and spacers.

Week	Subject Content Topic	Subject Content (50% of teaching time)	NEA connected activities (50% of teaching time)
		g) lamination (including use of specialist tools). http://www.bbc.co.uk/schools/gcsebitesize/design/graphics/mechanismfinishprintrev3.shtml Possible links here to the practical work, with sheet bending of aluminium and bending acrylic.	Lamp manufacture; aluminium rolling and acrylic bending. **INPUT:** The bending of the aluminium shade needs to be demonstrated on a set of rollers. It may be necessary to talk about annealing the aluminium at this point too. Allow class to continue practical activity and set the task of designing a shade decoration to be engraved on the acrylic at this point. Practical tasks from previous lessons need to be processed as equipment becomes available.
3	1.2 Metals	a) ferrous metals – mild steel, carbon steels, cast iron b) non-ferrous metals – aluminium, copper, zinc, tin c) alloys (ferrous and non-ferrous) – stainless steel, duralumin, brass. http://www.slideshare.net/fjpwhelan/metals-ferrous-and-non-ferrous?next_slideshow=1	Rendering techniques suitable for the materials chosen for the product. Coloured pencils Watercolour pencils Felt pen **INPUT:** Use the application of the listed techniques to demonstrate the rendering possibilities. Set worksheets could be used. Set a homework task of producing the final lamp in a chosen 3D presentation style in colour. This will form part of a short graphic presentation booklet that will accompany the lamp in the final submission.
	3.1 Processes techniques and specialist tools	b) alloying (including specialist tools). http://www.technologystudent.com/joints/alloys1.html	Lamp manufacture; screw threading, using taps and dies. **INPUT:** Demonstrate threading and preparation for internal screw cutting as used in the attaching of the spacers on the lamp body. As machine screws will be used for the male thread, dies are not needed in practical, but should be demonstrated. Continue with practical tasks; those from previous lessons need to be processed as equipment becomes available.

Week	Subject Content Topic	Subject Content (50% of teaching time)	NEA connected activities (50% of teaching time)
4	1.3 Polymers:	a) thermoplastics – acrylic, polyethylene, polyethylene terephthalate (PET), polyvinyl chloride (PVC), polypropylene (PP), acrylonitrile butadiene styrene (ABS). http://www.ruthtrumpold.id.au/destech/?page_id=83	Working drawings for communicating 2D technical information – 3rd angle orthographic projection. Cutting list, quantities costing. Demonstrate how to present a cutting list and use simple calculations to work out how to price component parts. Use of area and division should be included. Explain the term standard parts and how this can affect the cost. Set homework task to produce a series of component drawings to BS (British Standards) and submit a cutting list with cost calculations.
	3.1 Processes techniques and specialist tools	f) moulding – blow moulding, injection moulding, vacuum forming, extrusion, rotational moulding (including use of specialist tools).	Lamp manufacture; laser cutting and drape forming. **INPUT:** Demonstrate the use of the laser cutter and the processing of acrylic through it. All candidates need to engrave and cut an individual shade out for the lamp. Then continue with practical tasks. Those from previous lessons need to be processed as equipment becomes available.
5	1.4 Composites	b) thermosetting plastics – epoxy resins (ER), urea formaldehyde (UF), polyester resin (PR) c) elastomers – rubber. Composites– carbon fibre (CFRP), glass fibre (GRP).	Lamp manufacture/drawing portfolio. This is an ideal opportunity to develop iterative manufacturing skills and working independently. Encourage students to plan and structure their own practical work sessions – use homework time to add to the set drawing portfolio – deadline half term. **INPUT:** Demonstrate the vacuum former and show how it can be used to envelop the MDF base. Revise draft angles and vent holes as well as the main process.
	3.1 Processes techniques and specialist tools	e) Machining – milling/routing, drilling, (including use of specialist tools). Link to key tasks on the lamp project, in particular turning and boring.	

Week	Subject Content Topic	Subject Content (50% of teaching time)	NEA connected activities (50% of teaching time)
6	1.6 Textiles	Subject content Textiles: a) natural fibres – cotton, linen, wool http://msc-ks4technology.wikispaces.com/Textiles+-+Natural+fibres b) manmade fibres – nylon, polypropylene, polyester http://www.bbc.co.uk/schools/gcsebitesize/design/textiles/fibresrev1.shtml c) textile treatments – flame resistant, polytetrafluoroethylene (PTFE).	Lamp manufacture; electronics. **INPUT:** The circuit diagram needs to be given and explained. Chance here to build the PCB, or give out as a ready-constructed module. Demonstrate the circuit programming if available and show the opportunities for programming the LEDs. Allow students to continue with this part of the assembly or other tasks, depending upon what needs to be done on an individual basis.
	3.1 Processes techniques and specialist tools	c) printing – screen-printing, (including use of specialist tools i.e. colour sublimation) . https://www.youtube.com/watch?v=jKDMeRZoLJE https://www.youtube.com/watch?v=Me7x5n9vIPw https://www.rolanddga.com/blog/2016/06/02/22/42/3-things-you-should-know-about-dye-sublimation	
7	1.5 Papers and boards	Papers and boards: a) drawing papers – layout, tracing, copier, cartridge b) commercial printing papers – bond, coated c) boards – mounting board, corrugated board, foam board, folding box board, foil-lined board b) paper and board finishing process – laminating, varnishing, hot foil blocking, embossing (including use of specialist tools).	Lamp manufacture/drawing portfolio. **INPUT:** Continue with practical work as in previous lessons. The students need to make sure the product is completed and prepared for assessment.

Week	Subject Content Topic	Subject Content (50% of teaching time)	NEA connected activities (50% of teaching time)
		https://www.pearsonschoolsandfecolleges.co.uk/Secondary/DesignAndTechnology/14-16/EdexcelGCSEDesignandTechnology/Samples/SamplechapterfromEdexcelGCSEGraphicProducts/EdexcelGCSEGraphicProductsStudentBooksamplechapter.pdf http://www.mr-dt.com/materials/paperandboardtypes.htm http://www.bobst.com/uken/products/hot-foil-stamping/process/#.WKRJmrlXXIU	
	3.1 Processes techniques and specialist tools	c) printing – offset lithology, flexography, gravure (including use of specialist tools) https://www.prepressure.com/printing/processes/offset http://graphicproducts.weebly.com/printing-methods.html	
8	5 Factors influencing the development of products	5.4 Design theory through the influences and methods of the following key historical movements and figures: Arts and Crafts – William Morris. http://www.artyfactory.com/art_appreciation/graphic_designers/william_morris.html The teaching of FORM and FUNCTION will be undertaken as part of the designer's study. 5.3 The influence of aesthetics, ergonomics and anthropometrics on the design, development and manufacture of products: a) form over function	 Introduce the next assignment. This will be a passive speaker for a standard iPhone. Free apps are available for down load to iPhones that will enable simple measurement of sound. This may be useful to have in order to measure any improvements made with the passive speaker. This assignment will focus on designing and making, but students should be directed towards the use of wood as a primary material. https://itunes.apple.com/gb/app/decibel-10th-pro-noise-meter/id448155923?mt=8

Week	Subject Content Topic	Subject Content (50% of teaching time)	NEA connected activities (50% of teaching time)
		b) form follows function. Power point presentation explaining the underlying principles of form over function possible group presentation versus form follows function (counter group). https://www.guggenheim.org/arts-curriculum/topic/form-follows-function Example might be Juicy Salif https://www.youtube.com/watch?v=QSk4nC2hjgM or Hot Bertaa Kettle. https://www.youtube.com/watch?v=DL4BmtoKReg	Models can be quickly made in card to enable basic improvements of sound. Working in groups/pairs, investigate passive speakers on the internet and construct a model in card of a simple design to see if sound output can be improved. **INPUT:** Now working individually, sketch ideas using the collected data of phone ergonomics to establish designs for a passive speaker which is intended to be made from wood or plastics. Use the sketching techniques already learnt to enhance drawings and represent materials.  Introduce the concept of a specification, which will then be used to test the product at the end. Homework: write the specification, include performance, aesthetic criteria and ergonomic data.
	3.1 Processes techniques and specialist tools	a) heat treatments – hardening and tempering, casehardening, annealing, normalising (including use of specialist tools). http://www.slideshare.net/vivekroy908/heat-treatment-process-44829747?next_slideshow=1	
9	5 Factors influencing the development of products	b) Art Nouveau – Charles Rennie Mackintosh. The teaching of FORM and FUNCTION will be undertaken as part of the designer's study.	**INPUT:** Demonstrate the use of a router (CNC or manual). Discuss possibilities for cutting recesses in the wood for sound channelling. Continue the work on the passive speaker. Use appropriate modelling materials to establish a possible solution.

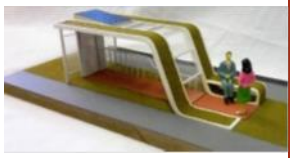
Week	Subject Content Topic	Subject Content (50% of teaching time)	NEA connected activities (50% of teaching time)
	3.1 Processes techniques and specialist tools	d) casting – sand (to include investment), die, resin, plaster of Paris (including use of specialist tools). https://www.youtube.com/watch?v=gBK0P4ASZ0o	**INPUT:** Demonstrate the use of the wood lathe (CNC or manual) to turn small symmetrical components in wood should they feature in any designs. Complete the designing process with final presentation drawings for homework, submit cutting list.
10	5 Factors influencing the development of products	c) Bauhaus Modernist – Marianne Brandt. The teaching of FORM and FUNCTION will be undertaken as part of the designer's study. https://www.bauhaus100.de/en/past/people/masters/marianne-brandt/	Begin the construction of the speaker project. This is designed to be a simple prototype involving perhaps only one significant manufacturing task of any real difficulty. The processing and manipulation of wood as a material is important and students will need inputs as and when necessary, depending upon the designs that have been developed. Encourage an iterative manufacturing/development process, changing as needs arise or develop.
	Processes	e) machining – turning, (including use of specialist tools).	Speaker manufacturing; continue with practical work. **INPUT:** Demonstrate the use of wood marking out tools, revising theory learnt already. Then continue with practical activities.
	3.1 Processes techniques and specialist tools	Set up, safe and accurate operation, advantages and disadvantages of the following digital technologies. b) computer-aided manufacture (CAM) and rapid prototyping – CNC lathes, CNC routers, CNC milling machine, CNC laser, CNC vinyl cutters, rapid prototyping. *Link to the speaker project with practical application of design needs to programming.*	

Week	Subject Content Topic	Subject Content (50% of teaching time)	NEA connected activities (50% of teaching time)
11	5 Factors influencing the development of products	d) Art Deco – Eileen Gray. The teaching of FORM and FUNCTION will be undertaken as part of the designer's study. http://www.eileengray.co.uk/	Joining components. Construction of the speaker boxes will be taking place by now and some knowledge of how to join wood with box/frame slab construction etc. **INPUT:** Demonstrate the use of different glues and fastening devices for wood; screws, pins, PVA, impact adhesive, epoxy resin. Then continue with practical activities.
	3.1 Processes techniques and specialist tools	e) machining - stamping, pressing (including use of specialist tools).	
12	5 Factors influencing the development of products	f) Streamlining – Raymond Loewy. The teaching of FORM and FUNCTION will be undertaken as part of the designer's study. http://www.raymondloewy.com/	Joining components. Continue with the practical work needed for the speaker construction. Add demonstrations as required; it may be useful to show a simple wood lamination process to show how to bend basic wood shapes. **INPUT:** Moulds, jigs and formers – show how these can be used to create simple structures with plastic, metal and wood. Then continue with practical activities.
	7.1 Safe working practices, potential hazards and risk assessment	Adopting safe working practices, recognise and react to potential hazards: a) understanding safe working practices for yourself and others when designing and making, including when selecting and safely using machinery, equipment and tools to ensure safe working environments b) understanding the need for risk assessments –	

Week	Subject Content Topic	Subject Content (50% of teaching time)	NEA connected activities (50% of teaching time)
		identification of potential hazards, identification of people at risk, evaluation of risks, implement control measures, recording and storing of risk assessment documentation.	
13	5 Factors influencing the development of products	g) Memphis – Ettore Sottsass. The teaching of FORM and FUNCTION will be undertaken as part of the designer's study. http://designmuseum.org/designers/ettore-sottsass	Continue with speaker manufacture. Independent processing. **INPUT:** Finishing techniques: varnishes, polish/waxes, paints, modelling materials. Then continue with speaker manufacture. Independent processing.
	5 Factors influencing the development of products	Principles, applications and the influence on design of anthropometrics and ergonomics: a) sources and applications of anthropometric data b) ergonomic factors for a designer to consider when developing products and environments with which humans react.	
14	5 Factors influencing the development of products	e) Post Modernism – Philippe Starck. The teaching of FORM and FUNCTION will be undertaken as part of the designer's study http://www.tate.org.uk/learn/online-resources/glossary/p/postmodernism http://www.starck.com/en	Presentation of final designs and testing and evaluating. **INPUT:** Show how the specification should be used to clarify the success or not of the final product.

Week	Subject Content Topic	Subject Content (50% of teaching time)	NEA connected activities (50% of teaching time)
	5 Factors influencing the development of products	The importance and influence of user-centred design in ensuring products are fit-for-purpose and meet the criteria of specifications when designing, making and evaluating in relation to: a) user needs, wants and values b) purpose c) functionality d) innovation e) authenticity.	Use the app mentioned previously to check on improvements to the sound levels. Discuss how aesthetic related spec points can be assessed and what other physical tests can be undertaken.
15		PAWS week	Present the new design assignment to be taken in the next half term – street furniture. **INPUT:** investigate how bus stops are used by the community and by the bus companies. TBC next term.

Year 12 Spring/Summer term

Week	Subject content topic	Subject Content (50% of Teaching Time)	NEA connected activities (50% of teaching time)
16	4.1 Digital technologies	Set up, safe and accurate operation, advantages and disadvantages of the following digital technologies: a) computer-aided design (CAD) – 2D and 3D design to create and modify designs and create simulations, 3D modelling for creating 'virtual' products.	Bus shelter design assignment – design and development of a model/prototype for a new bus shelter. The shelter should adopt a design study from the previous term's study 'Factors influencing the development of products'. The shelter should provide seating and an information point to show bus timings.  Students should be expected to put together a mini design portfolio to give them some experience of what will be required in the NEA later this year. This will also allow some experience of modelling designs in more of a concept or architectural manner. **INPUT:** Select an example to undertake product analysis on from the researched 'bus shelters' from last term. Discuss using the following headings: how the specification has been met by the designer; form, function, user requirements, sustainability. Use findings to formulate a specification for each individual bus shelter, with consideration of the chosen design style from last term.
	Designing	Research sizes, style, needs and existing shelters for street furniture project. **INPUT:** look in-depth at how the use of anthropometric data and ergonomics affects the design of products such as bus shelters.	

17	2.1 Performance characteristics of materials	2.1 Performance characteristics of woods, metals, polymers, smart and modern materials, papers, boards, textiles and composites to discriminate between materials and select appropriately: a) conductivity b) strength c) elasticity d) plasticity e) malleability f) ductility g) hardness h) toughness i) durability j) biodegradability.	Designing bus shelter. **INPUT:** Teach about design strategies, what are they and how they can be applied to designs, utilise input materials, particularly if they relate to a specific design style. Encourage the students to annotate and use whatever communication styles they can to convey top quality design sketching and communication. Spend time sketching and or modelling ideas.
	Designing	Designing bus shelter – time allocated to complete this work.	

18	3.4 Processes techniques and specialist tools	Uses, characteristics, advantages and disadvantages of the following permanent and semi-permanent joining techniques to discriminate between them, select appropriately and use safely: a) adhesives – contact adhesive, acrylic cement, epoxy resin, polyvinyl acetate (PVA), hot melt glue, cyanoacrylate (superglue), polystyrene cement (including use of specialist tools) d) jointing – traditional wood joints, knock-down fittings (including use of specialist tools).	Development of design ideas – modelling, technical detail and change. **INPUT:** Introduce the concept of sub-systems and how they work together to create the whole product. Stress the importance of changing and exploring different ways of solving the problem(s) faced in the development of the final solution. Show how technical knowledge can be applied theoretically of using modelling. Remember that the development should focus on the design using the 'real' materials and how they would affect the final product.
	Designing	Review of design ideas – use the specification to review the initial ideas presented and choose one or more to explore in further detail.	
19	3.4 Processes techniques and specialist tools	b) mechanical – screws, nuts, bolts, washers, rivets, press (including use of specialist tools) c) heat – oxy-acetylene welding, MIG welding, brazing, hard soldering, soft soldering (including use of specialist tools).	Development of a final proposal **INPUT:** Continue development to final proposal. The final proposal should show the bus shelter in its final format, possibly in its intended environment. Working drawings/CAD will be needed and materials for model sourced next week. Hand in for paper work will be Easter.
	Designing	Development of design ideas.	
20	3.5 Processes techniques and specialist tools	Application, advantages and disadvantages of the following finishing techniques and methods of preservation to discriminate between them and select appropriately for	Preparation for model making. **INPUT:** Time is allocated for final proposals and outstanding CAD drawings of final outcome**.** Cutting lists need to be submitted this week.

		use, including for the prevention of degradation: a) finishes – paints, varnishes, sealants, preservatives, anodising, electro-plating, powder coating, oil coating, galvanisation, cathodic protection (including use of specialist tools).	
	NEA 5	Production of working/final drawings for proposed outcome.	
21	3.5 Processes techniques and specialist tools	b) paper and board finishing process – laminating, varnishing, hot foil blocking, embossing (including use of specialist tools).	Practical – bus shelter. **INPUT:** Demonstrate how landscaping can be created on architectural models with the use of Styrofoam or Modroc. Show how architectural rendering can be achieved with whatever materials are appropriate to the centre. Continue with marking out and general practical construction.
	NEA 5	Time allocated for teaching an appropriate CAD package to enhance the presentation of the final design.	
22	1.7 Materials	Smart and modern materials: a) thermo-ceramics b) shape memory alloys (SMA) c) reactive glass d) liquid crystal displays (LCD) e) photo-chromic materials f) thermo-chromic materials g) quantum tunnelling composites. https://prezi.com/j9jdrsjbdsdz/a-level-smart-materials-dca/	Practical – bus shelter. **INPUT:** Continue with practical activities adding specialist input or demonstrations as required.

	NEA 5	Continue with the preparation of CAD final presentation drawings for the bus shelter.	
23		Revision and examination practice.	Practical – bus shelter. **INPUT:** Continue with practical activities, adding specialist input or demonstrations as required. The work is then to be submitted and assessed. This could be undertaken as a group exercise so that the assessment criteria can be discussed and shared. Students have the opportunity to see each other's mistakes and triumphs, which enables them to utilise or avoid these in their NEA next term. Deadline can be extended, depending upon whether students are taking study leave for possible AS exams.
	NEA 5	Continue with the preparation of CAD final presentation drawings for the bus shelter.	
24			
25			
26			
27			
28			
May Exams and possible NEA submission			
29	12 Further processes and techniques	Strategies, techniques and approaches to explore, create and evaluate design ideas: a) user-centred design.	NEA – Establishing a problem. NEA – Negotiating problem to study. **NEA Part 1.1** a) Investigation of the needs, wants and values of the client/end user.
	NEA Support	Advanced CAD use. Short unit of set tasks to support an appropriate CAD package.	

			b) Identification, investigation and justification of a design possibility. **INPUT:** Introduce the possible design starting points that are to be a focus for the students. Show how a relevant brief can be established. Research undertaken by students to establish a need for the forthcoming NEA.
30	12 Further processes and techniques	- framework process - problem solving - user needs, wants and values - limitations of end user consideration.	Research undertaken by students to establish a need for the forth coming NEA, in negotiation with teacher. **INPUT:** Individual discussions with students to establish a sound starting point. **NEA Part 1.2** a) Assess the needs, wants and values of the client/end user and the needs of the prototype.
	NEA Support	Advanced CAD use. Short unit of set tasks to support an appropriate CAD package.	
31	12 Further processes and techniques	b) circular economy – biologically-based systems and an understanding of how waste and pollution can be eliminated. https://www.ellenmacarthurfoundation.org/circular-economy/overview/concept c) systems thinking – the influence of systems on commercial activity to enable all elements of a manufacturing enterprise to work together.	**NEA Part 1.2** b) Research of existing commercial products, ergonomic information and standards relevant to the design possibility, using knowledge and understanding of designing and making. c) Consideration of user-centred design, taking into account the investigation of the identified design possibility, design context, and the needs, wants and values of the client/end user.

	NEA Support	Advanced CAD use. Short unit of set tasks to support an appropriate CAD package.	d) Consideration of levels of production and potential methods to improve the sustainability of the prototype across its life cycle.
32	11.1 Information handling, modelling and forward planning	Collection, collation and analysis of information and the use of this to make informed decisions: a) marketing – marketing analysis, research techniques, raw data/analysed data to enable enterprise to be encouraged. b) innovation management – cooperation between management, designers and production engineers, the encouragement of creativity. c) the use of feasibility studies on the practicability of proposed solutions.	**INPUT:** Due to the entirely independent nature of this area, students will be undertaking quite different research. They should be allowed to work on a research plan and have discussions with their teacher/mentor to establish where their needs will lead them in this section. There should be an input on what ways research could be presented and how important it is that research should be seen to be relevant and used. The use of research is often best evidenced by the way it links back to the established needs. This work may well take time to complete the suggested deadline is the end of term. Independent study on NEA.
	NEA Support	Advanced CAD use. Short unit of set tasks to support an appropriate CAD package.	
33	NEA	Independent study on NEA.	Independent study on NEA.
	NEA Support	Advanced CAD use. Short unit of set tasks to support an appropriate CAD package.	
34	NEA	Independent study on NEA.	Independent study on NEA.
	NEA Support	Advanced CAD use. Short unit of set tasks to support an appropriate CAD package.	

Year 13 Autumn term

Week	Subject content topic	Subject Content (50% of Teaching Time)	NEA connected activities (50% of teaching time)
1	8 Features of manufacturing industries	Characteristics and stages of the following methods of production when applied to products and materials: a) one-off production b) batch production c) high-volume production. http://www.slideshare.net/MrMcGowan74/methods-of-production-presentation	**1.3. Specification** a) Production of a refined design brief based on outcomes of research and investigations. b) Production of a technical design specification considering form, function, sustainability and standards relevant to the needs, wants and values of the intended client/end user. c) Evidence of client/end user influence in the specification. d) Identification and justification of performance requirements for the prototype. e) Consideration of scale of manufacture and how this reflects on relevant cost. Production of a refined design brief based on outcomes of research and investigations. b) Production of a technical design specification considering form, function, sustainability and standards relevant to the needs, wants and values of the intended client/end user. **INPUT:** Discussion about the need of the specification to be relevant and have obvious connection to the needs. This links to the research carried out before the specifications are written. The candidates need to be made aware of the need to test the specification too, so a degree of measurability in what is being stated should be included. Independent work on NEA.
	11.2 Information handling, modelling and forward planning	Modelling the costing of projects to achieve an optimum outcome: a) budgets – undertake financial forecasts b) planning for production – allocation of: - employees - materials - scale of production c) selection of appropriate tools, machines and manufacturing processes.	

Week	Subject content topic	Subject Content (50% of Teaching Time)	NEA connected activities (50% of teaching time)
2	8 Features of manufacturing industries	Characteristics, application, advantages and disadvantages of the following types of quality monitoring systems: a) quality control – the monitoring and achieving of high standards and degree of tolerance by inspection and testing, computer-aided testing b) quality assurance – monitoring the quality of a product from its design and development stage, through its manufacture, to its end-use performance and degree of customer satisfaction. http://www.slideshare.net/YogitaP/quality-assurance-vs-quality-control	**Part 2 Designing a prototype** **2.4 Design ideas** a) Production of a range of design proposals that are realistic, workable, and which address the criteria in the specification. b) Exploration of different design approaches, processes and techniques to produce realistic design ideas. c) Selection and application of design strategies and knowledge of materials and/or components, processes and techniques to produce design ideas that address client/end user needs, wants and values. d) Design ideas show consideration and use of aesthetics, including cultural and historical influences. e) Decisions made in consultation with the client/end user. **INPUT:** It may be useful to exemplify a range of design strategies, design presentation styles and methods of written communication. Students should be made to feel that the presentation of realistic designs is more important than beautifully presented work. The presentation of rough sketches on note paper can often show more of an iterative approach than any beautifully drawn CAD image. The involvement of users/clients is essential and there needs to be realistic collaboration and discussions in the design process. The work will hopefully progress like a story being told and the students need to not be afraid to back track or change direction. They do, however, need to make sure that story can be told either graphically or in written information. Decisions and choices should be documented as the work progresses and the specification needs to be realistically borne in mind.
	11.2 Information handling, modelling and forward planning	Modelling the costing of projects to achieve an optimum outcome: a) budgets – undertake financial forecasts b) planning for production – allocation of: - employees - materials - scale of production c) selection of appropriate tools, machines and manufacturing processes.	

Week	Subject content topic	Subject Content (50% of Teaching Time)	NEA connected activities (50% of teaching time)
3	8 Features of manufacturing industries	c) Total Quality Management (TQM) – when applied to quality assurance procedures and its impact on employees at every stage of the production process, ISO 9000.	**Part 2 Designing a prototype** **2.4 Design ideas** **INPUT:** Independent work on NEA. The work will need time to progress and students should be allowed to discuss their progress on a regular basis.
	11.3 Information handling, modelling and forward planning	The importance, implications and ways of protecting the intellectual property rights of designers, inventors and companies: a) patents b) copyrights c) design rights d) trademarks. http://www.slideshare.net/djpatahern/copyright-patents-and-trademarks	

Week	Subject content topic	Subject Content (50% of Teaching Time)	NEA connected activities (50% of teaching time)
4	8.3 Features of manufacturing industries	Characteristics, processes, application, advantages and disadvantages and the importance of considering accuracy of production and efficiency of modern manufacturing methods and systems when designing for manufacture for small, medium and large scale production: a) production scheduling and production logistics b) robotics in production – robots on fully-automated production and assembly lines/cells. http://www.slideshare.net/anirudhreddy123/robots-in-manufacturing	**Part 2 Designing a prototype** **2.4 Design ideas** **INPUT:** Independent work on NEA. The work will need time to progress and students should be allowed to review their progress on a regular basis.
	10.1 Current Legislation	From the consumer's point of view, the implications of consumer rights legislation to consumers and manufacturers: a) Consumer Rights Act (2015) b) Sale of Goods Act (1979).	
5	8.3 Features of manufacturing industries	c) materials handling systems – automated storage and retrieval systems (ASRS), automatic guided vehicles (AGVs).	**Part 2 Designing a prototype** **2.4 Design ideas**

Week	Subject content topic	Subject Content (50% of Teaching Time)	NEA connected activities (50% of teaching time)
	10.2 Current legislation	The principles and applications of health and safety laws and regulations and their impact on the designing and making process, including the consequences of non-adherence: a) health and safety regulation – the Health and Safety Executive and an awareness of relevant regulations to manufacturing industries b) Health and Safety at Work etc Act (1974) – the procedures to safeguard the risk of injury to people: personal protective equipment (PPE), signage, warning symbols c) Control of Substances Hazardous to Health (COSHH) regulations – the storage and use of solvent-based substances containing volatile organic compounds (VOCs).	**INPUT:** Independent work on NEA. The work will need time to progress and students should be allowed to review their progress on a regular basis.
6	8 Features of manufacturing industries	d) flexible manufacturing systems (FMS), modular/cell production systems.	**Part 2 Designing a prototype** **2.5 Development** a) Demonstration of the application of an iterative approach to design development. This is informed by the application of knowledge of materials and the needs, wants and values of the client/end user. b) Modelling/simulation used to test appropriate features including proportions, scale, function, subsystems. Modelling/simulation can be achieved using traditional materials, or 2D and/or 3D computer simulations. c) Ongoing developmental changes are informed by technical application of research, experimenting, and client/end user feedback to improve, refine and realise a design.
	11.4 Information handling, modelling and forward planning	Implication to designers, manufacturers and consumers of the following standards when developing designs and manufacturing products: a) British Standards (BSI and kite mark) b) European (CEN and CE) c) International Standards (ISO).	

Week	Subject content topic	Subject Content (50% of Teaching Time)	NEA connected activities (50% of teaching time)
7	8 Features of manufacturing industries	e) lean manufacturing using just-in-time (JIT) systems f) standardised parts, bought-in components.	**INPUT:** Independent work on NEA. The activities taking place will be varied. All students will have different demands and requirements. The initial input about the way development should proceed needs to be covered, referring to the discussions in the street furniture module in year 12. Students must consider changes to key sub-systems, input technical information, evidence trialling using modelling techniques as appropriate and make sure that the users' and clients' opinions are central to the decisions making process being adopted.
		Test week.	
8	8 Features of manufacturing industries	g) quick response manufacturing (QRM).	**Part 2 Designing a prototype** **2.5 Development** **INPUT:** Independent work on NEA. The work will need time to progress and students should be allowed to review their progress on a regular basis.
	12.2 Further processes and techniques	Applications, characteristics, advantages and disadvantages of the following project management strategies: a) critical path analysis – the handling of complex and time sensitive operations.	
9	8 Features of manufacturing industries	h) data integration – product data management (PDM), enterprise resource planning (ERP) systems.	**Part 2 Designing a prototype** **2.5 Development** **INPUT:** Independent work on NEA. The work will need time to progress and students should be allowed to review their progress on a regular basis.
	12.2 Further processes and techniques	b) scrum – how flexible, holistic product development is achieved. http://www.slideshare.net/mohanlate/introduction-to-scrumppt?next_slideshow=1	

Week	Subject content topic	Subject Content (50% of Teaching Time)	NEA connected activities (50% of teaching time)
		- increase customer satisfaction - increase profits.	
10	8 Features of manufacturing industries	i) concurrent manufacturing.	**Part 2 Designing a prototype** **2.5 Development** **INPUT:** Independent work on NEA. The work will need time to progress and students should be allowed to review their progress on a regular basis.
	12.2 Further processes and techniques	c) Six Sigma – the improvement of output quality of a process by identifying and removing the causes of defects and setting value targets of: - reduce process cycle time - reduce pollution - reduce costs.	
11	NEA	NEA mentoring.	**Part 2 Designing a prototype** **2.5 Development** **INPUT:** Independent work on NEA. The work will need time to progress and students should be allowed to review their progress on a regular basis.
	12.3 Further processes and techniques	The cost, sales, profit and market implications to the designer and manufacturer of the stages of a product's life cycle: • introduction stage • growth stage • maturity stage • decline stage.	
12	NEA	NEA mentoring.	**Part 2 Designing a prototype** **2.6 Design solution** a) Design proposals are refined down to a final design solution which includes all requirements for fitness for purpose, including technical details of all materials and/or component parts, processes and techniques.

Week	Subject content topic	Subject Content (50% of Teaching Time)	NEA connected activities (50% of teaching time)
13	NEA	NEA mentoring.	**Part 2 Designing a prototype** **2.7 Review of development and final idea** a) Critical analysis and evaluation of their own ideas and decisions while using an iterative design process leading to refinements of designs. b) Analysis and evaluation of designs and prototypes/products produced by others, including client/end user to inform design decisions. c) Analysis and evaluation of refinements to designs based on the design decisions made by others, including the client/end user, along with a consideration of the materials, components and manufacturing techniques that will be used for making the final prototype. d) Draw conclusions based on the analysis and evaluation, drawing together considerations about the appropriateness of the final prototype in meeting the needs of the specification.
14	NEA	NEA mentoring.	**Part 2 Designing a prototype** **2.6 Design solution** b) Specification of materials and/or components and processes shows consideration of sustainability. Decisions are made based on research information on the environmental costs of extracting and processing the selected materials, the prototype manufacture, lifespan and disposal. c) Application of the calculation and cost of materials based on quantities to reduce wastage.
15	NEA	NEA mentoring.	NEA project time.

Year 13 Spring/Summer term

Week	Subject content topic	Subject Content (50% of Teaching Time)	NEA connected activities (50% of teaching time)
16	9.1 Designing for maintenance and the cleaner environment	Characteristics, application, advantages and disadvantages of 'cleaner' design and technology – a product's life cycle in relation to the following sustainable development issues: a) material selection – source, quantity, quality, range, recyclability, biodegradability.	**Making final prototype** **INPUT:** The outset of manufacturing needs to be carefully planned. Students should be given examples of how the work is to be documented, with photographic diaries and records to show how the product has progressed from the proposal to final solution. It is vital to stress the need to show the detail in the manufacturing, some which cannot be seen easily in the final product. This could be exemplified with visual images of previous projects showing final images and getting students to assess how they were made or what was involved in the manufacture. This will highlight the need to maintain a record of their own manufacturing. It is also useful to point out at this stage how iterative manufacture can be, and be ready to tell the story of changes being made to designs at this late stage. Independent NEA practical.
	NEA	NEA mentoring.	
17	9.1 Designing for maintenance and the cleaner environment	b) manufacture – minimising energy use, simplification of processes, achieving optimum use of materials and components, considering material form, cost and scale of production.	**Making Final Prototype** **INPUT:** Independent NEA practical.
	NEA	NEA mentoring.	
18	9.1	c) distribution – efficient use of packaging, reduction of transport, alternatives to fossil fuels.	**Making Final Prototype**

Week	Subject content topic	Subject Content (50% of Teaching Time)	NEA connected activities (50% of teaching time)
	Designing for maintenance and the cleaner environment		**INPUT:** Independent NEA practical.
	NEA	NEA mentoring.	
19	9.1 Designing for maintenance and the cleaner environment	d) use – repair versus replacement, energy efficiency, efficiency ratings e) repair and maintenance – standardisation, modular construction, bought in parts.	**Making Final Prototype** **INPUT:** Independent NEA practical.
	NEA	NEA mentoring.	
20	9.1 Designing for maintenance and the cleaner environment	f) end of life – design for disassembly, recovered material collection, sorting and re-processing methods, energy recovery, environmental implications of disposal to landfill.	**Making Final Prototype** **INPUT:** Independent NEA practical.
	NEA	NEA mentoring.	
21	9.2 Designing for maintenance and the cleaner environment	The wider issues of using cleaner technologies: a) cost implications to the consumer and manufacturer. b) Sustainability – designing without jeopardising the potential for people in the future to meet their needs.	**Making Final Prototype** **INPUT:** Independent NEA practical.
	NEA	NEA mentoring.	
22		Revision and exam practice.	**Making Final Prototype** **INPUT:** Independent NEA practical.
	NEA	NEA mentoring.	

Week	Subject content topic	Subject Content (50% of Teaching Time)	NEA connected activities (50% of teaching time)
23		Revision and exam practice.	**Making Final Prototype** **INPUT:** Independent NEA practical.
	NEA	NEA mentoring.	
24		Revision and exam practice.	**Making Final Prototype** **INPUT:** Independent NEA practical.
	NEA	NEA mentoring.	
25		Revision and exam practice.	**Making Final Prototype** **INPUT:** Independent NEA practical.
	NEA	NEA mentoring.	
26		Revision and exam practice.	**Part 4 Evaluating own design and prototype** **4 Evaluation** a) An analysis of the prototype is performed that includes testing against the specification. b) Evaluation of the prototype in meeting the needs, wants and values of the client/end user and specification. c) An analysis and evaluation of the impact on the environment, including life-cycle analysis of the final prototype. **INPUT:** At this point the final product needs to go back to the user or/and client. Field trials are essential for this to be reviewed effectively. There needs to be a series of tests undertaken. These should be discussed prior to this being undertaken, highlighting the need to refer and review the specification points. Changes to the final outcome can be acknowledged and changes to the specification made, taking into account any iterative design changes that make it necessary.
	NEA	NEA mentoring.	

Week	Subject content topic	Subject Content (50% of Teaching Time)	NEA connected activities (50% of teaching time)
			Independent NEA practical.
27		Revision and exam practice.	Finalise NEA submission.
	NEA	NEA mentoring.	
28		Revision and exam practice.	Finalise NEA submission.
29		Revision and exam practice.	NEA Hand in date.
30		Revision and exam practice.	Revision and exam practice.
31		Revision and exam practice.	Revision and exam practice.
32		Revision and exam practice.	Revision and exam practice.
33		Revision and exam practice.	Revision and exam practice.

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