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| Subject Area : D&T - Product Design |
| Year Group : 11 | Unit of Work :NEA |
| Half Term : 1 | Skills :Intro communication of ideas - Use of annotated drawings that explain detailed development or the conceptual stages ofdesigning and help to develop, communicate, record and justify design ideasContinue annotation - Use of annotated drawings that explain detailed development or the conceptual stages ofdesigning and help to develop, communicate, record and justify design ideasHand in ideas - Intro analysis of Ideas to help them explore and develop their own ideasDevelopment - Students are to design and develop prototypes in response to client wants and needs. • satisfy the requirements of the brief• respond to client wants and needs• demonstrate innovation• are functional• consider aesthetics• are potentially marketable.Students should know and understand how to evaluate prototypes and be able to:• reflect critically, responding to feedback when evaluating their own prototypes• suggest modifications to improve them through inception and manufacture• assess if prototypes are fit for purpose.***Pupils must evidence this work as part of the recommended 20xA3 page portfolio***  |
| Reasons behind order of topic in this half term |
| The order of work during the term supports the completion of the NEA portfolio and supporting practical prototype. The natural order of design, from initial design brief through to finished outcome, is followed through terms 1-4. Students are encouraged to meet target deadlines in order to produce work which showcases their true potential. |

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| Subject Area : D&T - Product Design |
| Year Group : 11 | Unit of Work : NEA |
| Half Term : 2 | Skills :Development - Students are to design and develop prototypes in response to client wants and needs. • satisfy the requirements of the brief• respond to client wants and needs• demonstrate innovation• are functional• consider aesthetics• are potentially marketable.Students should know and understand how to evaluate prototypes and be able to:• reflect critically, responding to feedback when evaluating their own prototypes• suggest modifications to improve them through inception and manufacture• assess if prototypes are fit for purpose.Development - continued - demonstrate use of CAD/CAM to create initial modelsDevelopment and modelling, use of CAD as communication toolDevelopment - developed models as a result of previous anthropometric research Consideration of appropriate materials and components to make a prototype.How to select and use materials and componentsappropriate to the task considering:• functional need• cost• availability.Demonstrate techniques to pupils to show them how to prepare samples which can be annotated ready for use in the development section of their NEA * Textile based materials (how to sew, pleat, gather, quilt and pipe).
* Direct pupils how to select and use specialist tools and equipment, including hand tools, machinery, digital design & manufacture, appropriate for the material and/or task to complete quality outcomes.
* How to use them safely to protect themselves and others from harm.
* How to select and use specialist techniques and processes appropriate for the material and/or task and use them to the required level of accuracy in order to complete quality outcomes.
* How to use them safely to shape, fabricate and construct a high quality prototype, including techniques such as wastage, addition, deforming and reforming.

Development - consideration of materials, and suitabilityDevelopment - consideration of joining methods, manufacturing processesFinal Design - Demonstrate specification drawings - pupils to use specification diagrams to show constructional detail or assembly  Specification/Working Drawings, using dimensions and drawn to scale Completion of working drawings ***Pupils must evidence this work as part of the recommended 20xA3 page portfolio*** **Preparation for the Mock examination**- pupils will be guided as to how to successfully answer the examination questions using previous work completed as a recall tool. Pupils will be supported with revision materials, including the opportunity to purchase revision guides, Q&A booklets, revision cards. Access to Focus e-Learning, GCSE Pod, BBC Bite-size.Core Materials- Q&A work sheets to revise core materials sectionSpecialist Materials- Q&A worksheets  |
| Reasons behind order of topic in this half term |
| * The order of work during the term supports the completion of the NEA portfolio and supporting practical prototype. The natural order of design, from initial design brief through to finished outcome, is followed through terms 1-4. Students are encouraged to meet target deadlines in order to produce work which showcases their true potential.
* Mock examination preparation is the opportunity to revise and recall from topics covered in Year 10. This is necessary in order to prepare for the formal examination.
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| Subject Area : D&T - Product Design |
| Year Group : 11 | Unit of Work : NEA |
| Half Term : 3 | Skills :Manufacturing SpecificationManufacture of product - scaled to ensure feasibility in time allocated. Pupils must photograph each stage of the manufacture to create a Diary of Manufacture as homeworkManufacture of product - scaled to ensure feasibility in time allocated.   ***Pupils must evidence this work as part of the recommended 20xA3 page portfolio***  |
| Reasons behind order of topic in this half term |
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| Subject Area : D&T - Product Design |
| Year Group : 11 | Unit of Work : NEA |
| Half Term : 4 | Skills :Pupils must photograph each stage of the manufacture to create a Diary of Manufacture as homeworkEvaluation of product against Design Brief and SpecificationTesting with client, considerations of modifications both proposed and undertaken***Pupils must evidence this work as part of the recommended 20xA3 page portfolio*** **REVISION FOR EXAMINATION** |
| Reasons behind order of topic in this half term |
| * The order of work during the term supports the completion of the NEA portfolio and supporting practical prototype.
* Mock examination preparation is the opportunity to revise and recall from topics covered in Year 10. This is necessary in order to prepare for the formal examination.
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| Subject Area : D&T - Product Design |
| Year Group : 11 | Unit of Work : REVISION FOR EXAMINATION |
| Half Term : 5 | Skills : Revision and preparation for formal examinationPupils will be supported with revision materials, including a second opportunity to purchase revision guides, Q&A booklets, revision cards. Focus e-Learning, GCSE Pod, BBC Bite-size.Core Materials- Q&A work sheets to revise core materials sectionSpecialist Materials- Q&A worksheetsHalf Term : 5 Skills :1.1 New and emerging technologiesINDUSTRY• The impact of new and emerging technologies on:• the design and organisation of the workplace including automation and the use of robotics• buildings and the place of work• tools and equipment.ENTERPRISE• Enterprise based on the development of an effective business innovation:• crowd funding• virtual marketing and retail• co-operatives• fair trade.SUSTAINABILITY• The impact of resource consumption on the planet• Finite• non–finite• disposal of waste.PEOPLE• How technology push/market pull affects choice.• Changing job roles due to the emergence of new ways of working driven by technological changeCULTURE• Changes in fashion and trends in relation to new and emergent technologies. Respecting people of different faiths and beliefsSOCIETY• How products are designed and made to avoid having a negative impact on others:• design for disabled• elderly• different religious groupsENVIRONMENT• Positive and negative impacts new products have on the environment:• continuous improvement• efficient working• pollution• global warmingPRODUCTION TECHNIQUES AND SYSTEMS• The contemporary and potential future use of:• automation• computer aided design (CAD)• computer aided manufacture (CAM)• flexible manufacturing systems (FMS)• just in time (JIT)• lean manufacturingHOW THE CRITICAL EVALUATION OF NEW AND EMERGING TECHNOLOGIES INFORMS DESIGN DECISIONS?• That it is important to consider scenarios from different perspectives and considering:• planned obsolescence• design for maintenance• ethics• the environmentSkills :• 1.2 Energy generation and storage FOSSIL FUELSHow power is generated from:• coal• gas• oil.Arguments for and against the selection of fossil fuelsNUCLEAR POWERHow nuclear power is generated. Arguments for and against the selection of nuclear powerRENEWABLE ENERGYHow power is generated from:• wind• solar• tidal• hydro-electrical• biomass.ENERGY STORAGE SYSTEMS INCLUDING BATTERIES• Kinetic pumped storage systems• Alkaline and re-chargeable batteries.• 1.3 Developments in new materialsMODERN MATERIALSDevelopments made through the invention of new or improved processes eg Graphene, Metal foams and Titanium. Alterations to perform a particular function eg Coated metals, Liquid Crystal Displays (LCDs) and Nanomaterials.SMART MATERIALSThat materials can have one or more properties that can be significantly changed in a controlled fashion by external stimuli, such as stress, temperature, moisture, or PH eg shape memory alloys, thermochromic pigments and photochromic pigmentsCOMPOSITE MATERIALSThat composite materials are produced by combining two or more different materials to create an enhanced material e.g. glass reinforced plastic (GRP) and carbon fibre reinforced plastic (CRP).TECHNICAL TEXTILESHow fibres can be spun to make enhanced fabrics eg conductive fabrics, fire resistant fabrics, kevlar and microfibres incorporating micro encapsulation.Skills :• 1.4 Systems approach to designingINPUTS The use of light sensors, temperature sensors, pressure sensors and switches.PROCESSESThe use of programming microcontrollers as counters, timers and for decision making, to provide functionality to products and processes.OUTPUTSThe use of buzzers, speakers and lamps, to provide functionality to products and processes.• 1.5 Mechanical devicesDIFFERENT TYPES OF MOVEMENTThe functions of mechanical devices to produce linear, rotary, reciprocating and oscillating movements.CHANGING MAGNITUDE AND DIRECTION OF FORCELevers:• first order• second order• third orderLinkages:• bell cranks• push/pullRotary systems:• CAMs and followers• simple gear trains• pulleys and beltsSkills :• 1.6 Materials and their working propertiesPAPERS AND BOARDS Papers including:• bleed proof• cartridge paper• grid• layout paper• tracing paperBoards including:• corrugated card• duplex board• foil lined board• foam core board• ink jet card• solid white boardNATURAL AND MANUFACTURED TIMBERSHardwoods including:• ash• beech• mahogany• oak• balsaSoftwoods including:• larch• pine• spruceManufactured boards including:• medium density fibreboard (MDF)• plywood• chipboardMETALS AND ALLOYSFerrous metals including:• low carbon steel• cast Iron• high carbon/tool steelNon ferrous metals including:• aluminium• copper• tin• zinc Alloys including:• brass• stainless steel• high speed steelPOLYMERSThermoforming including:• acrylic (PMMA)• high impact polystyrene (HIPS)• high density polythene (HDPE)• polypropylene (PP)• polyvinyl chloride (PVC)• polyethylene terephthalate (PET)Thermosetting including:• epoxy resin (ER)• melamine-formaldehyde (MF)• phenol formaldehyde (PF)• polyester resin (PR)• urea–formaldehyde (UFTEXTILESNatural fibres including:• cotton• wool• silkSynthetic fibres including:• polyester• polyamide (nylon)• elastane (lycra) Blended and mixed fibres including:• cotton/polyester woven including:• plain weaveNon-woven including:• bonded fabrics• felted fabricsKnitted textiles including:• knitted fabricsMATERIAL PROPERTIESIn relation to the main categories outlined above (not the specific materials identified), students should know and understand physical properties such as:• absorbency (resistance to moisture)• density• fusibility• electrical and thermal conductivity.In relation to the main categories outlined above (not the specific materials identified), students should know and understand working properties such as:• strength• hardness• toughness• malleability• ductility and elasticity.Skills : 2 Specialist technical principlesIn addition to the core technical principles, all students should develop an in-depth knowledge and understanding of the following specialist technical principles:• selection of materials or components• forces and stresses• ecological and social footprint• sources and origins• using and working with materials• stock forms, types and sizes• scales of production• specialist techniques and processes• surface treatments and finishes2.1 Selection of materials or componentsIn relation to at least one material category or system, students should be able to select materials and components considering the factors listed below• Functionality: application of use, ease of working.• Aesthetics: surface finish, texture and colour.• Environmental factors: recyclable or reused materials.• Availability: ease of sourcing and purchase.• Cost: bulk buying.• Social factors: social responsibility.• Cultural factors: sensitive to cultural influences.• Ethical factors: purchased from ethical sources such as FSC2.2 Forces and stressesMaterials and objects can be manipulated to resist and work with forces and stressesTension, compression, bending, torsion and shear.Materials can be enhanced to resist and work with forces and stresses to improve functionalityHow materials can be reinforced, stiffened or made more flexible: eg lamination, bending, folding, webbing, fabric interfacing.2.3 Ecological and social footprintEcological issues in the design and manufacture of productsDeforestation, mining, drilling and farming.Mileage of product from raw material source, manufacture, distribution, user location and final disposal.That carbon is produced during the manufacture of products.The six RsReduceRefuseRe-useRepairRecycleRethink.Social issues in the design and manufacture of productsSafe working conditions; reducing oceanic/ atmospheric pollution and reducing the detrimental (negative) impact on others.2.4 Sources and originsPrimary sources of materials and the main processes involved in converting into workable forms for at least one material area.• Paper and board (how cellulose fibres are derived from wood and grasses and converted into paper).• Timber based materials (Seasoning, conversion and creation of manufactured timbers).• Metal based materials (extraction and refining).• Polymers (refining crude oil, fractional distillation and cracking).• Textile based materials (obtaining raw material from animal, chemical and vegetable sources, processing and spinning).2.5 Using and working with materialsProperties of materialsStudents must know and understand how different properties of materials and components are used in commercial products, how properties influence use and how properties affect performance.Students must know and understand the physical and mechanical properties relevant to commercialproducts in their chosen area as follows:• Papers and boards (flyers/leaflets and card based food packaging).• Timber based materials (traditional timber children’s toys and flat pack furniture).• Metal based materials (cooking utensils and hand tools).• Polymers (polymer seating and electrical fittings).• Textile based materials (sportswear and furnishings).• Electronic and mechanical systems (motor vehicles and domestic appliances).The modification of properties for specific purposes• Additives to prevent moisture transfer (paper and boards).• Seasoning to reduce moisture content of timbers (timber based materials).• Annealing to soften material to improve malleability (metal based materials).• Stabilisers to resist UV degradation (polymers).• Flame retardants reduce combustion and fire hazards (textile based materials).• Photosensitive PCB board in PCB manufacture and anodizing aluminium to improve surfacehardness (electronic and mechanical systems).How to shape and form using cutting, abrasion and addition• Papers and boards (how to cut, crease, score, fold and perforate card).• Timber based materials (how to cut, drill, chisel, sand and plane).• Metal based materials (how to cut, drill, turn, mill, cast, bronze and weld).• Polymers (how to cut, drill, cast, deform, print and weld).• Textile based materials (how to sew, pleat, gather, quilt and pipe).• Electronic and mechanical systems (how to cut, drill and solder).Skills : 2.6 Stock forms, types and sizesCommercially available types and sizes of materials and components.Papers and boards:• sheet, roll and ply• sold by size eg A3, thickness, weight and colour• standard components eg fasteners, seals and bindings• cartridge paper and corrugated card.Timber based materials:• planks, boards and standard moldings• sold by length, width, thickness and diameter• standard components eg woodscrews, hinges, KD fittings.Metal based materials:• sheet, rod, bar and tube• sold by length, width, thickness and diameter• standard components eg rivets, machine screws, nuts, and bolts.Polymers:• sheet, rod, powder, granules, foam and films• sold by length, width, gauge and diameter• standard components eg screws, nuts and bolts, hinges.Textile based materials:• yarns and fabrics• sold by roll size, width, weight and ply• standard components eg zips, press studs, velcro.Electrical and mechanical components:• sold by quantity, volt and current rating• standard components eg E12 resistor series, dual in line IC packages (DIL), microcontrollers (PIC).2.7 Scales of productionHow products are produced in different volumes.The reasons why different manufacturing methods are used for different production volumes:• prototype• batch• mass• continuous.2.8 Specialist techniques and processesThe use of production aidsHow to use measurement/reference points,templates, jigs and patterns where suitable.Tools, equipment and processesA range of tools, equipment and processes that can be used to shape, fabricate, construct and assemblehigh quality prototypes, as appropriate to the materials and/or components being used including:wastage, such as:• die cutting• perforation• turning• sawing• milling• drilling• cutting and shearingaddition, such as:• brazing• welding• lamination• soldering• 3D printing• batik• sewing• bonding• printingdeforming and reforming such as:• vacuum forming• creasing• pressing• drape forming• bending• folding• blow moulding• casting• injection moulding• extrusion.How materials are cut shaped and formed to a toleranceThe manufacture to minimum and maximum measurements.Extracting information on tolerances and using it to control quality and make a prototype.Commercial processesPapers and boards (offset lithography and die cutting).• Timber based materials (routing and turning).• Metal based materials (milling and casting).• Polymers (injection molding and extrusion).• Textile based materials (weaving, dying and printing).• Electrical and mechanical systems (pick and place assembly and flow soldering).The application and use of Quality Control to include measurable and quantitative systems used during manufacture• Papers and boards (registration marks).• Timber based materials (dimensional accuracyusing go/no go fixture).• Metal based materials (dimensional accuracy using a depth stop).• Polymers (dimensional accuracy by selecting correct laser settings).• Textile based materials (dimensional accuracy checking a repeating print against an originalsample).• Electrical and mechanical systems (UV exposure, developing and etching times in PCB manufacture).2.9 Surface treatments and finishesThe preparation and application of treatments and finishes to enhance functional and aesthetic properties.• Papers and boards (printing, embossing and UV varnishing).• Timber based materials (painting, varnishing and tanalising).• Metal based materials (dip coating, powder coating and galvanizing).• Polymers (polishing, printing and vinyl decals).• Textile based materials (printing, dyes and stain protection).• Electronic and mechanical systems (PCB lacquering, and lubrication).Surface treatments to inhibit corrosion and oxidation.Reasons behind order of topic in this half term• Subject Area : D&T - Product DesignYear Group : 11 Unit of Work : REVISION FOR EXAMINATIONHalf Term : 6 Skills : PAST PAPERS and MARK SCHEMESEXAMINATIONReasons behind order of topic in this half term•  |
| Reasons behind order of topic in this half term |
| * Recall and revision for the formal GCSE examination
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