

KS4 Electronic Products Curriculum Plan 2014-15

10 hours taught per fortnight

AQA GCSE Specification

<http://www.aqa.org.uk/subjects/design-and-technology>

Full details of the units:

Topic	Content summary
Designing Skills	<ul style="list-style-type: none">• be creative and innovative when designing;• design products to meet the needs of clients and consumers;• understand the design principles of form, function and fitness for purpose;• understand the role that designers and product developers have, and the impact and responsibility they have on and to society;• analyse and evaluate existing products, including those from professional designers;• develop and use design briefs and specifications for product development;• consider the conflicting demands that moral, cultural, economic, and social values and needs can make in the planning and in the designing of products;• consider environmental and sustainability issues in designing products;• consider health and safety in all its aspects;• anticipate and design for product maintenance where appropriate;• design for manufacturing in quantity and to be aware of current commercial/industrial processes;• generate design proposals against stated design criteria, and to modify their proposals in the light of on-going analysis, evaluation and product development;• reflect critically when evaluating and modifying their design ideas and proposals in order to improve the products throughout inception and manufacture;• use, where appropriate, a range of graphic techniques and ICT (including digital media), including CAD, to generate, develop, model and communicate design proposals;• investigate and select appropriate materials and components;• plan and organise activities which involve the use of materials and components when developing or manufacturing;• devise and apply test procedures to check the quality of their work at critical/key points during development, and to indicate ways of modifying and improving it when necessary;• communicate the design proposal in an appropriate manner;• be flexible and adaptable when designing;• test and evaluate the final design proposal against the design specification;• evaluate the work of other designers to inform their own practice;• recognise the advantages of working collaboratively as a member of a design team;• understand the need to protect design ideas.
Making Skills	<ul style="list-style-type: none">• select and use tools/equipment and processes to produce quality products;• consider the solution to technical problems in the design and

	<p>manufacture process;</p> <ul style="list-style-type: none"> • use tools and equipment safely with regard to themselves and others; • work accurately and efficiently in terms of time, materials and components; • manufacture products applying quality control procedures; • have knowledge of Computer-Aided Manufacture (CAM) and to use as appropriate; • ensure, through testing, modification and evaluation, that the quality of their products is suitable for intended users and devise modifications where necessary that would improve the outcome(s); • recognise the advantages of working as part of a team when designing and making products.
Materials and components	<p>Knowledge and understanding of materials and making processes will be of sufficient depth for candidates to make an appropriate and reasoned choice when designing and making an electronic system. Knowledge and understanding of the materials and processes may be tested in the written examination, but knowledge of the properties and characteristics of other common materials will not be tested in the written papers. It is expected that candidates through their coursework will be able to show a general knowledge of the properties and characteristics of a wider range of materials, including textiles. The knowledge and understanding of components will be delivered through consideration of the electronic building block circuits. Candidates will develop their understanding of the concepts of input, process and output and the importance of feedback in controlling systems. They should be able to describe the function of the building blocks listed below and be able to combine two or more of them to satisfy a design specification.</p>
Design and market influences	<p>Candidates are required to demonstrate their design and technology capability through acquiring and applying knowledge, skills and understanding when evaluating processes and products and examining the wider effects of design and technology on society.</p> <p>Evaluation Techniques Adaptations</p> <p>Candidates should be taught to generate design proposals to satisfy the brief and specifications, and modify their proposals in the light of ongoing analysis and product development including prototyping.</p> <p>Quality Candidates should be taught to:</p> <ul style="list-style-type: none"> • suggest modifications which will improve the performance of the product and match previously identified moral, cultural, environmental or sustainability considerations; • know why quality is important at all stages (quality assurance) of the designing and making process and how testing (quality control) can be applied to industrial products and candidates' own work. <p>Social, Cultural, Moral, Environmental and Sustainability Issues Candidates should be taught to:</p> <ul style="list-style-type: none"> • consider the following when examining the wider effects of design and technology on society when designing and making solutions: <ul style="list-style-type: none"> — pollution and health hazards associated with electronic systems — the recycling of household electrical appliances — the elimination of dangerous chemicals from landfill sites by the collection of batteries and cells — the recycling of materials for reuse — the designing of products to use recycled materials

	<ul style="list-style-type: none"> --- products designed to be recycled --- the sustainability of products --- designing for maintenance --- product life-cycle and its stages, the introductory stage, the growth stage, the maturity stage, the declining stage linked to sales, profit, and product evolution. • automation and its implications on job opportunities; • the moral issues of products designed with planned product obsolescence and their impact on life style; • extensive marketing of products which are labelled as fashion items and are targeted at the consumer; • industrial applications of electronic systems; • identify and describe the use of micro-processors within society and explain the positive and negative effects; • be aware of the social, economic and environmental changes brought about by the development of electronic technology. <p>Information and Communication Technology Using Computer Aided Design (CAD) Candidates should be taught to:</p> <ul style="list-style-type: none"> • be aware of CAD and use it where appropriate; • understand how CAD is used to generate designs for electronic circuits, PCB track layouts and cases; • understand how CAD can be used to model electronic systems, to test system proposals or calculate values; • understand how CAD can be used to develop programmes which control microcontrollers. <p>Computer Aided Manufacture (CAM) Candidates should be taught to:</p> <ul style="list-style-type: none"> • understand the use of photo-etch, milling routing method to produce a PCB e.g. to make a mask to be used in PCB production or use a routing machine to cut the profile of a PCB; • understand the use of a CNC milling machine to produce moulds for injection moulding or use a CNC routing machine to produce moulds for vacuum forming; • understand the use of a laser cutting machine or rapid prototyping machine to manufacture cases or suitable packaging to house an electronic circuit and battery; • show awareness of how CAD/CAM enables easier, faster and more flexible methods of manufacture, e.g. Computer Integrated Manufacture (CIM), developing product and design, stock control, high speed assembly, automatic production and quality control.
<p>Processes and Manufacture</p>	<p>Manufacture products using a range of materials and processes. Have a broad understanding of manufacturing systems for the production of commercial products both in the industrial and the developing world.</p> <p>Health and Safety</p> <ul style="list-style-type: none"> • show awareness of the implications of Health and Safety when designing and making; • apply safe practice and procedures when working with electronic systems in practical situations; • recognise hazards in products, activities and environments when working with electricity; • work safely with tools, equipment and materials, in practical activities and in different environments, including those that are unfamiliar; • recognise hazards, assess consequent risks and take steps to control the risks to themselves, and others, in a variety of workshop situations

including, the use of tools, equipment and processes to manipulate resistant materials and construct electronic systems;

- distinguish between immediate and cumulative risks;
- be aware of ways to manage environments to ensure the safety of themselves and others;
- use equipment and components safely and act in an appropriate manner in the event of an accident.

Industrial Practice

- anticipate the implications that volume production will have on the design of a product;
- use a range of industrial applications when working with familiar materials and processes;
- take account of industrial considerations and constraints when designing and making;
- demonstrate knowledge of industrial practices;
- show awareness of industrial practices when designing and making.

Construction Techniques

- design and build electronic circuits of high quality using a variety of temporary and permanent construction methods;
- use temporary construction methods to prototype electronic circuits including breadboards and electronic prototyping kits;
- understand permanent construction methods to manufacture an electronic circuit, i.e. stripboard, etching, milling or routing with components soldered in place;
- understand the difference between the through hole construction method and the surface mount component method in the design and manufacture of electronic circuit boards;
- understand the use of pick and place component machines, wave soldering baths, wire stripping and cutting machines in the industrial manufacturing process.

Test Equipment

Candidates should be taught to understand the use of multimeters, logic probes and LED testers to inspect components and fault find electronic circuits.