



CORE TECHNICAL PRINCIPLES

New and Emerging Technologies

INDUSTRY. The impact of new and emerging technologies on:	R	A	G
the design and organisation of the work place (automation)			
the design and organisation of the work place (robotics)			
buildings and the place of work			
tools and equipment			
WEBLINKS https://www.bbc.com/bitesize/guides/zn4bcj6/revision/1			
ENTERPRISE. Enterprise based on the development of effective business innovation	R	A	G
crowd funding			
virtual marketing and retail			
co-operatives			
fair trade			
WEBLINKS https://www.bbc.com/bitesize/guides/zn4bcj6/revision/2			
SUSTAINABILITY. The impact of resource consumption on the planet	R	A	G
finite			
non-finite			
disposal of waste			
ecological footprints of materials			
social footprints of materials			
WEBLINKS https://www.bbc.com/bitesize/guides/zn4bcj6/revision/3 https://www.bbc.com/bitesize/guides/zn4bcj6/revision/4			
PEOPLE.	R	A	G
how technology push affects choice			
how market pull affects choice			
how job roles can change owing to new ways of working driven by technological change			
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CULTURE.	R	A	G
changes in fashion and trends in relation to new technologies			
respecting people of different faiths and cultures			
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SOCIETY. How products are designed and made to avoid having a negative impact on others	R	A	G
design for disabled			
design for elderly			
design for different religious groups			
WEBLINKS https://www.bbc.com/bitesize/guides/zn4bcj6/revision/7			
ENVIRONMENT. Positive and negative impacts new products have on the environment	R	A	G
continuous improvement			
efficient working			
pollution			
global warming			
WEBLINKS https://www.bbc.com/bitesize/guides/zn4bcj6/revision/4			
PRODUCTION TECHNIQUES AND SYSTEMS. The contemporary and future use of:	R	A	G
automation			
computer aided design (CAD)			
computer aided manufacture (CAM)			
flexible manufacturing systems (FMS)			
just in time (JIT)			
lean manufacturing			
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How emerging technologies develop design decisions	R	A	G
planned obsolescence			
design for maintenance			
ethics			
the environment			
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ENERGY GENERATION AND STORAGE

Students should understand how energy is generated and stored and how this is used as the basis for the selection of products and power systems.

FOSSIL FUELS. How power is generated from:	R	A	G
coal			
gas			
oil			
arguments for and against the selection of fossil fuels			
how to choose appropriate energy sources for manufacture			
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NUCLEAR POWER	R	A	G
how nuclear power is generated			
arguments for and against nuclear power			
WEBLINKS https://www.bbc.com/bitesize/guides/zf8ck2p/revision/2			
RENEWABLE ENERGY. How power is generated from:	R	A	G
wind			
solar			
tidal			
hydro-electrical			
biomass			
arguments for and against the selection of renewable energy			
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Energy storage systems including batteries	R	A	G
kinetic pumped storage systems			
alkaline and re-chargeable batteries			
how to choose appropriate energy sources			
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DEVELOPMENTS IN NEW MATERIALS

Students should be aware of developments in new materials

MODERN MATERIALS	R	A	G
Developments made through the invention of new or improved processes: - Graphene - Metal Foams - Titanium			
Alterations to perform a particular function - Coated metals - Liquid Crystal Displays (LCD's) - Nanomaterials			
WEBLINKS https://www.bbc.com/bitesize/guides/zfq8jty/revision/1			
SMART MATERIALS	R	A	G
Define smart material			
Understand how they can change based on stress, temperature, moisture, PH etc.			
Properties of: - Shape memory alloys - Thermochromic pigments - Photochromic pigments			
WEBLINKS https://www.bbc.com/bitesize/guides/zfq8jty/revision/2			
COMPOSITE MATERIALS	R	A	G
Define composite materials			
Properties of: - Glass reinforced plastic (GRP) - Carbon fibre reinforces plastic (CRP)			
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TECHNICAL TEXTILES	R	A	G
Define technical textiles			
Properties of: - Conductive fabrics - Fire retardant fabrics - Kevlar - Microfibers incorporating micro encapsulation			
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SYSTEMS APPROACH TO DESIGNING

Students should consider electronic systems including programmable components to provide functionality to products and processes and enhance and customise their operation

INPUTS	R	A	G
The use of light sensors (Light Dependent Resistors / LDRs)			
The use of temperature sensors (Thermistors)			
The use of pressure sensors			
The use of switches (Push / Latching)			
The names and circuit symbols of the components			
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PROCESSES	R	A	G
Programming microcontrollers using flowchart symbols			
Programming a microcontroller for timing			
Programming a microcontroller for decision making			
Programming a microcontroller to add functionality to products and processes			
WEBLINKS https://www.bbc.com/bitesize/guides/z6kr97h/revision/2 https://www.bbc.com/bitesize/guides/z6kr97h/revision/3 (we use a flowchart method in school)			
OUTPUTS	R	A	G
The use of buzzers			
The use of speakers			
The use of lamps			
The use of outputs to add functionality to products			
The names and circuit symbols of the components			
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MECHANICAL DEVICES

Different types of movement	R	A	G
The functions of mechanical devices to produce movement: - Linear - Rotary - Reciprocating - Oscillating			
Visualise and represent 2D and 3D objects of mechanisms and mechanical movement			
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Changing magnitude and direction of forces	R	A	G
Levers: - first order - second order - third order			
Linkages - bell cranks - push/pull			
Rotary Systems - CAMs and followers - Simple gear trains - Pulleys and belts			
The actions of forces and how levers and gears transmit and transform the effects of forces			
Arithmetic and numerical computation (use ratios)			
Use angular measurements in degrees			
Visualise and represent 2D and 3D objects of mechanisms and mechanical movement			
Knowledge of the function of mechanical devices to produce different sorts of movement			
Knowledge of the function of mechanical devices to change the magnitude of forces			
Knowledge of the function of mechanical devices to change the direction of forces			
WEBLINKS Levers: https://www.bbc.com/bitesize/guides/zbt26yc/revision/2 Linkages: https://www.bbc.com/bitesize/guides/zbt26yc/revision/3 Cams: https://www.bbc.com/bitesize/guides/zbt26yc/revision/4 Gears: https://www.bbc.com/bitesize/guides/zbt26yc/revision/5 Pulleys: https://www.bbc.com/bitesize/guides/zbt26yc/revision/6			



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MATERIALS AND THEIR WORKING PROPERTIES

Students should know and understand the categorisation of the types and properties of the following materials.

Papers and boards	R	A	G
Papers including: - Bleed proof - Cartridge paper - Grid - Layout paper - Tracing paper			
Boards including: - Corrugated card - Duplex board - Foil lined board - Foam core board - Ink jet card - Solid white board			
Classification of the types of properties of papers and boards			
Physical properties of papers and boards when designing and making			
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Natural and manufactured timbers	R	A	G
Hardwoods including: - Ash - Beech - Mahogany - Oak - Balsa			
Softwoods including: - Larch - Pine - Spruce			
Manufactured Boards including: - Medium density fibreboard (MDF) - Plywood - chipboard			
Classification of the types of properties of natural and manufactured timbers			
Physical properties of natural and manufactured timbers when designing and making			
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Metals and alloys	R	A	G
Ferrous metals including: - low carbon steel - cast iron - high carbon / tool steel			
Non ferrous metals including: - aluminium - copper - tin - zinc			
Alloys including: - brass - stainless steel - high speed steel			
Classification of the types of properties of metals and alloys			
Physical properties of metals and alloys when designing and making			
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Polymers	R	A	G
Thermoforming 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 (UF)			
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Textiles	R	A	G
Natural fibres including: - cotton - wool - silk			
Synthetic fibres including: - polyester - polyamide (nylon) - elastane (lycra)			
Blended and mixed fibres including: - cotton/polyester			
Woven including: - plain weave			
Non-woven including: - bonded fabrics - felted fabrics			
Knitted textiles including: - knitted yarns			
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MATERIALS PROPERTIES

Students should have an understanding of the working and physical properties of the materials in the materials categories above.

Material properties	R	A	G
Physical properties: - absorbency (resistance to moisture) - density - fusibility - electrical and thermal conductivity			
Working properties: - strength - hardness - toughness - malleability - ductility and elasticity			
Use scientific vocabulary to explain the differences between materials			
Explain the use of specific materials owing to their specific properties			
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