

Students must revise this core knowledge and the material specialism of either timber or textiles which is on a separate document.

## 1.1 The impact of new and emerging technologies

1.1.1 Industry:	Little	Some	Good	Page in book
a unemployment				<b>1 to 10</b>
b workforce skill set				
c demographic movement				
d science and technology parks.				




1.1.2 Enterprise:				
a privately-owned business				
b cloud funding				
c government funding for new business start-ups				
d not-for-profit organisations.				







1.1.3 Sustainability:				
a transportation costs				
b pollution				
c demand on natural resources				
d waste generated.				

1.1.4 People:				
a workforce				
b consumers				
d people with disabilities				
e wage levels				
f highly-skilled workforce				
g apprenticeships.				

## 1.2 How the critical evaluation of new and emerging technologies informs design decisions; considering contemporary and potential future scenarios from different perspectives, such as ethics and the environment

1.2.1 How to critically evaluate new and emerging technologies that inform design decisions:	Little	Some	Good	Page in book
				<b>11 to 15</b>
a budget constraints				
b timescale				
c who the product is for				
d the materials used				
e manufacturing capabilities.				

1.2.2 How critical evaluations can be used to inform design decisions, including the consideration of contemporary and potential future scenarios:				
a natural disasters				
b medical advances				
c travel				
d global warming				
e communication.				
1.2.3 Ethical perspectives when evaluating new and emerging technologies:				
a where it was made				
b who was it made by				
c who will it benefit				
d fair trade products.				
1.2.4 Environmental perspectives when evaluating new and emerging technologies:				
a use of materials				
b carbon footprint				
c energy usage and consumption during manufacture and transportation				
d life cycle analysis (LCA).				
1.3 How energy is generated and stored in order to choose and use appropriate sources to make products and power systems				
1.3.1 Sources, generation and storage of energy:	Little 	Some 	Good 	Page in book
				15 to 19
a fossil fuels – oil, gas, coal				
b biofuels – biodiesel and biomass				
c tidal				
d wind				
e solar				
f hydroelectric.				
1.3.2 Powering systems:				
a batteries and cells				
b solar cells				
c mains electricity				
d wind power.				
1.3.3 Factors to consider when choosing appropriate energy sources to make products and power systems:				
a portability of the power source				
b environmental impact				
c power output				
d circuit/system connections				
e cost.				




<b>1.4 Developments in modern and smart materials, composite materials and technical textiles</b>				
<b>1.4.1 Modern and smart materials:</b>	Little 	Some 	Good 	Page in book
				<b>19 to 25</b>
a shape-memory alloys (SMAs)				
b nanomaterials				
c reactive glass				
d piezoelectric materials				
e temperature-responsive polymers				
f conductive inks.				
<b>1.4.2 Composites:</b>				
a concrete				
b plywood				
c fibre/carbon/glass				
d reinforced polymers				
e robotic materials.				
<b>1.4.3 Technical textiles:</b>				
a agro-textiles				
b construction textiles				
c geo-textiles				
d domestic textiles				
e environmentally friendly textiles				
f protective textiles				
<b>1.5 The functions of mechanical devices used to produce different sorts of movements, including the changing of magnitude and the direction of forces</b>				
<b>1.5.1 Types of movement:</b>	Little 	Some 	Good 	Page in book
				<b>25 to 33</b>
a linear				
b reciprocation				
c rotary				
d oscillation.				
<b>1.5.2 Classification of levers:</b>				
a class 1, 2 and 3				
b calculations related to mechanical advantage (MA), velocity ratio (VR), load, effort and efficiency.				
<b>1.5.3 Linkages:</b>				
a bell crank				
b reverse motion linkages.				
<b>1.5.4 Cams:</b>				
a pear shaped				
b eccentric (circular)				
c drop (snail).				
<b>1.5.5 Followers:</b>				
a roller				
b knife				

c flat followers.				
<b>1.5.6 Pulleys and belts:</b>				
a V-belt				
b velocity ratio (VR)				
c input and output speeds.				
<b>1.5.7 Cranks and sliders.</b>				
<b>1.5.8 Gear types:</b>				
a simple and compound gear train				
b idler gear				
c revolutions per minute (RPM) calculations				
d bevel gears				
e rack and pinion.				
<b>1.6 How electronic systems provide functionality to products and processes, including sensors and control devices to respond to a variety of inputs, and devices to produce a range of outputs</b>				
<b>1.6.1 Sensors, including:</b>	Little	Some	Good	Page in book
				<b>33 to 35</b>
a the role of sensors in electronic systems				
b light-dependent resistors (LDRs)				
c thermistor.				
<b>1.6.2 Control devices and components, including:</b>				
a the role of switches in electronic systems				
b transistors				
c resistors.				
<b>1.6.3 Outputs, including:</b>				
a the role of outputs in electronic systems				
b buzzers				
c light-emitting diodes (LEDs).				
<b>1.7 The use of programmable components to embed functionality into products in order to enhance and customise their operation</b>				
	Little	Some	Good	Page in book
				<b>35 to 37</b>
1.7.1 How to make use of flowcharts.				
1.7.2 How to switch outputs on/off in relation to inputs and decisions.				
1.7.3 How to process and respond to analogue inputs.				
1.7.4 How to use simple routines to control outputs with delays, loops and counts.				
<b>1.8 The categorization of the types, properties and structure of ferrous and non-ferrous metals</b>				
<b>1.8.1 Ferrous metals, including:</b>	Little	Some	Good	Page in book
				<b>37 to 40</b>
a mild steel				
b stainless steel				




c cast iron.				
<b>1.8.2 Non-ferrous metals, including:</b>				
a aluminium				
b copper				
c brass.				
<b>1.8.3 Properties, including:</b>				
a ductility				
b malleability				
c hardness.				
<b>1.9 The categorization of the types, properties and structure of papers and boards</b>				
<b>1.9.1 Paper, including:</b>	Little	Some	Good	Page in book
				<b>40 to 43</b>
a copier paper				
b cartridge paper				
c tracing paper.				
<b>1.9.2 Board, including:</b>				
a folding boxboard				
b corrugated board				
c solid white board.				
<b>1.9.3 Properties, including:</b>				
a flexibility				
b printability				
c biodegradability.				
<b>1.10 The categorisation of the types, properties and structure of thermoforming and thermosetting polymers</b>				
	Little	Some	Good	Page in book
				<b>42 to 47</b>
<b>1.10.1 Thermoforming polymers, including:</b>				
a acrylic				
b high impact polystyrene (HIPS)				
c biodegradable polymers – Biopol®.				
<b>1.10.2 Thermosetting polymers, including:</b>				
a polyester resin				
b urea formaldehyde.				
<b>1.10.3 Properties, including:</b>				
a insulator of heat				
b insulator of electricity				
c toughness.				
<b>1.11 The categorisation of the types, properties and structure of natural, synthetic, blended and mixed fibres, and woven, non-woven and knitted textiles</b>				
<b>1.11.1 Natural, including:</b>	Little	Some	Good	Page in book
				<b>47 to 52</b>
a animal – wool				
b vegetable – cotton.				

<b>1.11.2 Synthetic, including:</b>				
a polyester				
b acrylic.				
<b>1.11.3 Woven, including:</b>				
a plain – calico				
b twill – denim.				
<b>1.11.4 Non-woven, including:</b>				
a felted wool fabric				
b bonded fibres/webs.				
<b>1.11.5 Knitted, including:</b>				
a weft-knitted fabrics				
b warp-knitted fabrics.				
<b>1.11.6 Properties, including:</b>				
a elasticity				
b resilience				
c durability.				




**1.12 The categorisation of the types, properties and structure of natural and manufactured timbers**

<b>1.12.1 Natural timbers – hardwoods, including:</b>	Little 	Some 	Good 	Page in book
				<b>52 to 55</b>
a oak				
b mahogany				
c beech				
d balsa.				
<b>1.12.2 Natural timbers – softwoods, including:</b>				
a pine				
b cedar.				
<b>1.12.3 Manufactured timbers, including:</b>				
a plywood				
b medium density fibreboard (MDF).				
<b>1.12.4 Properties, including:</b>				
a hardness				
b toughness				
c durability.				




**1.13 All design and technological practice takes place within contexts which inform outcomes**

<b>1.13.1 A wide range of materials, components and manufacturing processes for a range of contexts, to inform outcomes, including:</b>	Little 	Some 	Good 	Page in book
				<b>55 to 58</b>
a the properties of materials and or components				
b the advantages and disadvantages of materials components and manufacturing processes				
c justification of the choice of materials and				

**1.14 Investigate environmental, social and economic challenges when identifying opportunities and constraints that influence the processes of designing and making**

	Little 	Some 	Good 	Page in book
				<b>58 to 62</b>
1.14.1 Respect for different social, ethnic and				
1.14.2 An appreciation of the environmental,				
1.14.3 The main factors relating to 'Green Designs'.				
1.14.4 The main factors relating to recycling and				
1.14.5 Human capability.				
1.14.6 Cost of materials.				
1.14.7 Manufacturing capability.				
1.14.8 Environmental impact – life cycle analysis				




**1.15 Investigate and analyse the work of past and present professionals and companies in order to inform design**




1.15.1 Analysing a product to the following specification criteria:	Little 	Some 	Good 	Page in book
				<b>62 to 66</b>
a form				
b function				
c client and user requirements				
d performance requirements				
e materials and components/systems				
f scale of production and cost				
g sustainability				
h aesthetics				
i marketability				
j consideration of innovation.				

**1.15.2 The work of past and present designers and companies:**

a Alessi				
b Apple				
c Heatherwick Studio				
d Joe Casely-Hayford				
e Pixar				
f Raymond Loewy				
g Tesla				
h Zaha Hadid.				

**1.16 Use different design strategies to generate initial ideas and avoid design fixation**

1.16.1 Use of different design strategies, including:	Little 	Some 	Good 	Page in book
				<b>66 to 68</b>
a collaboration				
b user-centred design				
c systems thinking.				

1.17 Develop, communicate, record and justify design ideas, applying suitable techniques.				
1.17.1 Develop and use a range of communication techniques and media to present the design ideas, including:	Little 	Some 	Good 	Page in book
a freehand sketching (2D and/or 3D)				
b annotated sketches				
c cut and paste techniques				
d digital photography/media				
e 3D models				
f isometric and oblique projection				
g perspective drawing				
h orthographic and exploded views				
i assembly drawings				
j system and schematic diagrams				
k computer-aided design (CAD) and other				
1.17.2 Record and justify design ideas clearly and effectively using written techniques.				