New & Emerging Technologies: Industry, Enterprise & People

Automation	Processes and functions being performed by robots and machinery instead of people.
Workplace	The environment where your paid employment is.
Equipment	The tools and machines used in the production and planning of a product.
Tools	These are used to cut, shape, smooth and manipulate a material during the manufacturing process to make it into a product.
Crowdfunding	When a group of people pledge money to pay for an idea, product or service.
Virtual marketing	Advertisement campaigns that take place online.
Virtual retail	Buying and selling products and services online.
Co-operative	A business that is run by a group of people who all share the responsibility, profits and gains.
Fair trade	An agreement between retailer and producer that a price paid to the producer is enough to cover costs and provide a decent standard of living.
Technology push	When technology develops and new products get produced for the market.
Market pull	When consumer trends and fashion increase demand for a product, service or function.
Technological change	The difference in the world created by the introduction of new technology.
Fashion	Current preferences in style, appearance or behaviour, as dictated by society.
Trend	A change, development or latest craze.
Inclusive	Design that considers all users.
Exclusive	Design that is aimed at a specific target market, and that is difficult, unappealing or unobtainable for other users.
Ethics	Moral principles that help a person, group of people or company decide what actions and decisions are right and wrong.
Disabled	A user with impaired ability.
Elderly	An older user.
Religious group	A collection of people who have the same spiritual belief system.
Positive impact	Affecting something or someone in a beneficial way.

New & Emerging Technologies: Sustainability & Environment

Finite	A resource that is limited or non-renewable.
Non-finite	A resource that is renewable or not limited.
Dispose of	To get rid of.
Lifecycle assessment	Calculating and evaluating how long a product will last for and what impact the product will have throughout its life.
Recycle	To process the raw materials of an item and use them again in a different way.
Reduce	To limit consumption.
Reuse	To repurpose or extend the useful life of a material or product.
Rethink	To revaluate your perspective on a product, service, company or necessity.
Refuse	Say no to excess consumption.
Repair	Fix something that is broken or worn.
Renewable	Not limited or finite.
Non-renewable	Finite or limited.
Biodegradable	Waste that decomposes; something that disintegrates into the ecosystem over time.
Resources	Raw materials, information, money, stock or ingredients that can be used to create something or develop knowledge.
Forest Stewardship Council	FSC is an international non-profit organisation. The logo certifies that the wood or paper comes from a sustainably managed source.
Carbon footprint	The contribution of a process or organisation to greenhouse gas emissions.
Planned obsolescence	The practice of designing a product to last for a limited time so that the consumer will have to buy more or replace the item more often.
Designed for maintenance	The practice of designing a product to last for a long time and to be able to be repaired.
Global warming	The gradual rise in temperature of the entire planet due to a build-up of greenhouse gases trapping heat within Earth's atmosphere.
Pollution	Substances that contaminate and have a negative impact on the environment.
Greenhouse gases	Gases that contribute to global warming.
Efficiency	A method of completing a task or process quickly, without wastage and cost effectively.
Continuous improvement	Making the manufacturing process better whenever possible. Saving money, time and resources.

New & Emerging Technologies: Production Techniques & Systems

Computer-aided design	Using digital tools and modelling packages to create concepts and work through problems.
Computer-aided manufacture	Using tools that are controlled digitally to create a product.
Just-in-time	A production method that manufactures to order.
Flexible systems manufacturing	A production style where machines are placed around a central control point. Improves reaction times to changes in the manufacturing process.
Lean manufacturing	A method of production that aims to reduce waste as much as possible.
3D printer	A machine that builds up layers of materials to produce a prototype.
Laser cutter	A machine that uses a laser to cut or etch sheet material.
Computer numerical control	Tools, machines, robots and processes that are controlled by computers.
Assembly line	A layout of machines or employees that perform tasks in succession in order to fabricate products repetitively.
First-generation robot	A robot that has a preset program that it performs repeatedly.
Second-generation robot	A robot that can perform a job repeatedly but also has sensors to relay information and improve its ability to perform the job.
Third-generation robot	A robot that uses sensors and programming to improve its functionality. It is capable of 'artificial intelligence'.
Artificial intelligence	A term referring to the way a third-generation robot can gather and use data to inform decisions and improve on its function.

Energy Generation & Storage

Fossil fuels	A natural source that can be used as an energy source. Made from the buried remains of plant and animals.
Energy sources	Materials or processes that are used to produce energy, power and fuel.
Coal	A fossil fuel formed from plant and animal remains that died millions of years ago. Accessed by mining deep underground.
Gas	A fossil fuel formed from plant and animal remains that died millions of years ago. Accessed by drilling or a process called fracking.
Crude oil	A fossil fuel formed from plant and animal remains that died millions of years ago. Accessed by drilling deep underground.
Mining	The process used to extract coal from underground.
Fracking	The process used to access oil and gas by drilling into rock with water, chemicals and sand at high pressure.
Nuclear power	A power source that produces energy through the process of fission.
Fission	The process used to produce power from nuclear material.
Wind power	A renewable energy source that is converted to power using turbines above water.
Solar power	A renewable energy source that comes from the sun.
Tidal power	A renewable energy source that is converted to power using turbines under water, specifically in the sea.
Hydroelectric	Electrical power produced by using turbines powered by moving water. Used to harness energy from dams.
Biomass	A fuel made up of organic matter that can be burnt or turned into biofuels.
Alkaline	A substance which has a pH higher than 7.
Rechargeable	A battery that can be returned to full power repeatedly.
Kinetic pumped storage	Water is released from an upper reservoir into a lower reservoir. The flowing water turns a generator, producing electricity to boost the supply.

Modern Materials, Composite Materials & Technical Textiles

Graphene	A material discovered in 2004 that is as thin as 1 atom is 200 times stronger than steel and conducts electricity really well.
Metal foams	A material that combines the properties of a base metal with a porous structure, making it lighter.
Nanomaterials	Materials that are made up of very small components. They are used to provide properties such as being antibacterial or self-cleaning.
Technical specification	A written document that details the functions, quantity information, properties and other important information about a product or material.
Properties	Attributes that belong to a material, e.g. strong, flexible.
Liquid crystal display	A screen made up of pixels emitting red, green and blue light. Changing the amount and colour of the light allowed through makes a full colour range.
Titanium	A very low-density metal which is often used for medical procedures and aircraft building, where less weight is a crucial property.
Combination	A mixture or blend of two or more things.
Composite	One material that is made up of two or more materials. The aim is to create a material with improved properties.
Glass-reinforced plastic	A composite material that is made by adding strands of glass to a polymer resin. It is often used for boat hulls and car bodies.
Carbon-fibre-reinforced plastic	A composite material that is a polymer that has been strengthened with strands of carbon. Strong and lightweight, it is commonly used for skis.
Fibres	Strands that have been harvested from natural sources or made synthetically. The strands can be processed to become fabric or yarn.
Fabric	A material made up of fibres that are bonded, woven or knitted.
Fire-resistant	A material that does not easily ignite and is designed to burn very slowly.
Conductivity	How well, or not, a material lets electrical or thermal energy flow through it.
Kevlar	A technical fabric that is stronger than steel, weight for weight. It is often used in combat clothing or protective clothing.
Microfibre	A manufactured strand than is 60 times finer than human hair.
Microencapsulation	Tiny 'bubbles' of substances or scents that are fixed into fabric. These 'bubbles' break with time and use.

Smart Materials

Temperature	How hot or cold something is.
Light	What photochromic materials react to.
Moisture	A small amount of liquid.
Sensitive	Highly reactive.
pH	A scale used to measure the level of acidity or alkalinity.
Thermochromic	Describes a material or pigment that reacts to heat.
Photochromic	Describes a material or pigment that reacts to light.
Shape memory alloy	A metal-based material that returns to a set shape when it reaches a certain temperature.
Pigment	A substance used to (either naturally or artificially) determine the colour of a material.
Nanotechnology	Changing materials at an atomic level to modify their properties.
Hydrophobic	Describes a material that repels water.
Electroluminescent	Describes a material that produces light when a current is passed through it.
Phosphorescent	Describes a material that produces light in the dark after it has been exposed to a light source for a period of time.
Piezoelectric	Describes a material that makes electrical energy from mechanical energy.
Thermoelectric	Describes a material that becomes cold on one side and hot on the other when a current is passed through it.
Magneto-rheological	Describes a liquid that becomes solid if exposed to a magnetic field.

Systems Approach to Designing

Light sensor	An electrical component that can sense when it is dark or not.
Temperature sensor	An electrical component that can sense when it is hot or cold.
Pressure sensor	An electrical component that can sense when there is a weight on it or not.
Switch	An electrical component that can be used to make or break a circuit and turn things on and off.
Push to make	A type of switch that needs to be pressed to complete the circuit.
Push to break	A type of switch that stops the current flowing when pressed.
Microcontroller	A small, programmable device used for specific functions within an electronic system.
Microprocessor	A small, programmable device used for multiple functions within an electronic system.
Counter	An electrical component that counts actions or events within an electrical system, e.g. how many times a LED flashes on and off.
Timer	An electrical component that times actions or events within an electrical system, e.g. the number of seconds between a LED flashing on and off.
Decision-making	The process by which an electrical system chooses its next action if there is more than one outcome possible.
Functionality	The use of a product or material.
Buzzer	An electrical component that can emit a simple noise. Usually used for an alarm or signal.
Speaker	An electrical component used to play music or other audio files.
Lamp	An electrical component that emits light. A common type is a filament bulb.
Light-emitting diode	An electrical component that emits light but uses a small amount of current and can create light in different colours.

Mechanical Devices

Mechanical	A mechanism; not dependant on human interaction.
Linear	In one direction.
Rotary	Goes around in a circle.
Reciprocating	Goes back and forth in a straight line.
Oscillating	Swings back and forth.
Movement	A change in physical position.
Forces	The influences on an object. Push and pull.
Magnitude	The size of something.
Direction	The way in which something goes or travels, or the way in which a force is exerted.
Lever	A mechanism that is used to modify force and motion. Can reduce the input force needed.
First-order	A lever that has the load and the effort either side of the fulcrum. E.g. Crowbar.
Second-order	A lever that has the load and the effort on the same side of the fulcrum with the load closer to the fulcrum. E.g. A wheelbarrow.
Third-order	A lever that has the load and the effort on the same side of the fulcrum with the effort closer to the fulcrum. E.g. Tweezers.
Fulcrum	The point a lever uses to pivot.
Linkage	A mechanism used to transfer motion between mechanisms.
Bell crank	A mechanism used to translate motion at a right angle.
Push	A force away from the origin.
Pull	A force towards the origin.
Rotary systems	Mechanisms that use circular movement.
Cam and follower	A rotating wheel with a shaped profile turns. A rod follows the profile and changes the rotary motion to a reciprocating motion.
Gears	Wheels that interlock using teeth.
Simple gear train	More than one interlocking gear. Each gear is on its own shaft.
Pulley	A mechanism that helps with lifting loads.
Belt	The linkage between two pulleys.

Acronyms

Forest Stewardship Council	FSC
Computer-aided design	CAD
Computer-aided manufacture	CAM
Just-in-time	JIT
Flexible manufacturing systems	FMS
Computer numerical control	CNC
Glass-reinforced plastic	GRP
Carbon-fibre-reinforced plastic	CRP
Light-emitting diode	LED
Liquid crystal display	LCD
Medium-density fibreboard	MDF
Acrylic	PMMA
High-impact polystyrene	HIPS
High-density polyethylene	HDPE
Low-density polyethylene	LDPE
Polypropylene	PP
Polyvinyl chloride	PVC
Polyethylene terephthalate	PET
Epoxy resin	ER
Melamine-formaldehyde	MF
Phenol formaldehyde	PF
Polyester resin	PR
Urea-formaldehyde	UF

Material Categories: Paper & Boards

Physical properties	What a material is or what it does even when not in use, e.g. colour, transparency, texture.
Bleed proof	Smooth paper often used with felt tips so that ink doesn't spread.
Cartridge	Textured paper that is high quality, used often used for artistic drawing and watercolour.
gsm	Grams per square metre; the thickness of paper or board.
Grid	Paper with printed horizontal and vertical lines which make it ideal for isometric drawings or orthographic drawings.
Layout	Thin paper that can be used to draw on over an underlay. Works well with spirit markers and is cheaper than tracing paper.
Tracing	Thin, strong, translucent paper that can be used to draw on over an underlay. Works well with spirit markers.
Corrugated	Board made up of a layer of fluted board sandwiched between two layers of liner board. Light but strong, it is often used for secondary packaging.
Duplex	Different finishes and textures on either side of a board. A way of cutting costs and production processes if only one side will be seen.
Foil-lined	Board, often used for food packaging, that is lined with a layer designed to keep food fresh and contained.
Foam core	Board made up of a layer of polystyrene sandwiched between two layers of card. Light but strong, it is often used for mounting and modelling.
Ink jet	Paper that is coated and absorbs ink to create a crisp and clean printing finish.
Solid white board	Board often used for primary packaging, highly bleached and of high quality, which provides an excellent printing surface.
Paper	A material made from wood pulp that is under 200 GSM.
Board	A material made from wood pulp that is over 200 GSM.

Material Categories: Natural & Manufactured Timbers

Hardwood	A wood that usually comes from broad-leaved, deciduous trees that grow slowly.
Softwood	Wood that comes from fast-growing coniferous trees.
Ash	A hardwood that is pale brown and is often used for tool handles and furniture.
Beech	A hardwood that is pale brown with a pink tinge. It is often used for toys and furniture.
Mahogany	A tropical hardwood that is rich, reddish brown. It is often used for expensive, good-quality furniture.
Oak	A hardwood that is strong, light brown, often used for interior wood or good-quality furniture and classically used for building ships.
Balsa	A pale, very lightweight hardwood that is easy to work with and great for model making.
Larch	A reddish softwood with durable and waterproof qualities. It is often used for decking, cladding and yacht building.
Pine	A knotty softwood. It is often used to make cheaper furniture and telegraph poles.
Spruce	A pale softwood which is often used for papermaking and as timber for building.
Teak	A hardwood that is weather resistant and durable. It is often used for outdoor furniture.
Manufactured board	A material made from gluing together fibres, strips or chips of wood. This makes large, even sheets of material.
Medium-density fibreboard	A manufactured board more commonly referred to as MDF. It is made from softwood fibres that have been reformed and glued into board.
Plywood	A manufactured board that is made up of thin layers of wood with alternating grain directions. It can be bent and veneered.
Chipboard	A manufactured board made from wood particles stuck together. Cheap but not very strong, it is often veneered and used for inexpensive furniture.
Wax	A surface finish for wood that is applied with a cloth or wire wool. It enhances the natural grain and needs regular reapplication.
Oil	A wood treatment which maintains the natural finish but can provide some protection for use outdoors. Is a more durable finish than wax.
Varnish	A wood treatment which protects and seals the surface of the wood and gives it a smooth finish. Can be either gloss or matt.

Material Categories: Metals & Alloys

Metal	A material that is often shiny, hard, strong and durable.
Alloy	A mix of two metals to create a metal with improved properties.
Ferrous	Describes a metal that contains iron.
Non-ferrous	Describes a metal that doesn't contain iron.
Low-carbon steel	Also known as mild steel, this alloy is mainly made of iron. It is easily shaped but harder than iron. It is often used for car bodies.
Cast iron	Grey in colour, this ferrous metal is strong if compressed but is very brittle. It is often used to make bench vices.
High-carbon steel	An alloy mainly made of iron. It is usually used for drill bits and tools. It has been widely replaced with high-speed steel.
Aluminium	A lightweight, non-ferrous metal that is resistant to corrosion and often used for making drinks cans.
Copper	A reddish, non-ferrous metal that is malleable, ductile and extremely good at conducting electricity and heat. Often used for pipes and wiring.
Tin	A soft, malleable non-ferrous metal that is corrosion-resistant and weak. It is often used for soft solder.
Zinc	A blueish-grey, non-ferrous metal that resists corrosion and is often used for coating steel. It is not very strong on its own.
Brass	A non-ferrous metal that is yellowish. It is corrosion resistant, strong, malleable and ductile. It is often used for hardware on doors.
Stainless steel	A ferrous metal that is hard and resistant to rust and has a shiny, silvery finish. It is often used for cutlery.
High-speed steel	An alloy of iron and a mix of other elements. It is usually used for drill bits and tools. It has a higher cutting performance than high-carbon steel.

Material Categories: Polymers

Thermoforming	Describes a plastic that can be heated and reformed.
Thermosetting	Describes a plastic that cannot be reformed and will burn if heated.
Acrylic	A thermoforming plastic that is hard, takes colour well and is shiny. Used for clear storage shelves, helmet visors and baths.
High-impact polystyrene	A cheap and ridged thermoforming plastic commonly used for vacuum forming.
High-density polyethylene	A thermoforming plastic that is lightweight, strong and stiff. Often used for water pipes and baskets. Indicated by recycling symbol number 2.
Low-density polyethylene	A thermoforming plastic that is lightweight and flexible. Often used for laminating paper and shopping bags. Indicated by recycling symbol number 4.
Polypropylene	A thermoforming plastic that is resistant to chemicals and work fatigue. It is light and tough. It is used for lunchboxes, plastic furniture, etc.
Polyvinyl chloride	Often referred to as PVC, this thermoforming plastic is brittle, durable and cheap. It is used for pipes and music records.
Polyethylene terephthalate	This thermoplastic is tough, strong and light it is often used for transparent water bottles. Indicated by recycling symbol number 1.
Epoxy resin	A thermosetting plastic that is used for circuit boards and as a bonding agent. It is durable, corrosion resistant and ridged.
Melamine-formaldehyde	A thermosetting plastic that is used for outdoor tableware and to laminate chipboard. It is hard and strong.
Phenol formaldehyde	A thermosetting plastic that was the basis for Bakelite. It used to be used for circuit boards.
Polyester resin	A thermosetting plastic that is brittle and stiff. It is resistant to chemicals and is a good electrical insulator. Used for casting and bonding.
Urea-formaldehyde	Often used for electrical fittings, this thermosetting plastic is a good electrical insulator.

Material Categories: Textiles

Natural fibres	Harvested from natural sources and processed to become fabric or yarn.
Cotton	A natural fibre produced from the seedpods of a plant.
Linen	A natural fibre produced from the stalk of the flax plant.
Wool	A natural fibre produced by sheep or goats.
Silk	A natural fibre produced by a worm.
Synthetic	Fibres that are manufactured.
Polyester	A synthetic fibre that is strong, hydrophobic and resilient. It is often mixed with cotton to improve the material's properties.
Polyamide	A synthetic fibre that is hard-wearing and strong. It is used for seat belts, ropes and carpets as well as clothes. Often called Nylon.
Elastane	A synthetic fibre used in swimwear and sportswear as well as in combination with other fabrics to provide stretch and hardwearing properties.
Blended fibre	A combination of different types of fibres to make a yarn.
Mixed fibre	A combination of different types of yarn, of one type of fibre, to make fabric.
Woven	Two sets of yarns that are interlaced, creating a strong, flat and non-stretchy fabric that can be printed on.
Non-woven	Synthetic fibres that are glued or melted together. The fabric doesn't stretch or fray. Often called bonded fabric.
Bonded	Synthetic fibres that are glued or melted together. The fabric doesn't stretch or fray.
Felt	Fibres are matted together to create a dense, weak fabric.
Knitted	Yarns are interlocked using loops. This results in a stretchy fabric that traps air in the loops, making it warm to wear.

Material Properties

Absorbency	How well, or not, a material takes in and holds liquid.
Density	How closely packed the material is.
Fusibility	The ability to turn from a solid state to a liquid state when exposed to heat.
Thermal	Related to temperature.
Electricity	Energy in the form of charged electrons or ions.
Strength	The ability to tolerate forces without breaking.
Hardness	The ability to resist scratches, dents or rubbing.
Toughness	The ability to absorb impact and not break or snap.
Malleable	Able to be moulded.
Stress	The force that is put on a material.
Ductile	Able to be pulled into thin sections, like wires.
Elasticity	The ability of a material to return to its previous shape after being compressed or stretched.
Flexible	Able to bend without breaking.