adhesive *- Glue. Adhesives are used to bond or glue materials together. Most adhesives grip onto the microscopic texture of the material's surface. Roughening the surface or keying helps all adhesives to work. Some adhesives dissolve the materials surface and then reform as a weld when the solvent evaporates. These solvent weld adhesives are used on some thermoplastics e.g. tensol cement on acrylic.*

abrasive *- Abrasives are used to make surfaces smooth. They are usually paper backed but can be cloth backed. Start with a coarse grade and then work through the grades to finish with a fine or smooth grade.*

acrylic - *A thermo plastic. Available in a range of bright colours and can be opaque or transparent. A hard surface - can be brittle.*

aesthetics - *Attractive - How it looks. Is it a desirable object.*

aluminium - *A light metal. Non ferrous. Grey silver in colour. Corrosion resistant but not for marine use. Used in the manufacture of cans, alloy wheels and aircraft.*

analyse - *to look very closely at the problem. To break down into basic parts so that the problem can be understood. Analysis is used in the early stages of the design process.*

annotation - *detailed notes or explanations added to labels.*

anodise - *An electrochemical treatment performed on aluminium. The protective oxide layer increases in thickness and can be dyed to produce a coloured finish.*

anthropometrics - *The measurement of people to produce tables of data. The information can then be used to design products suitable for people to use. e.g clothes that fit or chairs that are the right size for children.*

artefact - *The product. An object that has been designed and made.*

ball bearing - *A perfectly spherical ball made from high carbon steel alloy. They are used to make bearings which reduce friction in rotating parts such as wheels.*

ball pein hammer - *A hammer which has one flat face and one rounded face (the ball pein). Used for riveting.*

bandsaw - *A power saw where the saw blade is a continuous loop or band. The blade travels over two or three wheels, one of which is driven. The blade is kept true by blade guides above and below the table.*

batch production - *Production of identical artefacts in limited numbers e.g. a dozen cakes.*

bevel - *An angle on the edge of the material. Bevels can be produced by planing, filing or by using an abrasive. Similar to a chamfer. A bevel gauge can be used to set the angle - sometimes used to mark out dovetail joints.*

blow moulding - *an industrial process used to make bottles and other hollow artefacts.*

brief - *A short and clear statement of what is to be designed and made. The design task.*

BSI - *British Standards Institution. The organisation which sets the standards for a wide range of manufacturing activities from designing to safety.*

CAD - *Computer aided design. Prodesktop and 2D Design work is CAD.*

caliper - *Used to measure. Internal calipers can be used to take a measurement from inside a tube for example. External calipers measure outside dimensions. See also Odd Leg calipers.*

cam - *A wheel with the axis set off centre. As the cam rotates, a cam follower resting on its outside edge will rise and fall.*

CAM - *Computer Aided Manufacture Computers control the machines manufacturing the product*

cantilever - *A strut which is very securely held at one end so that large forces may be placed at the other end. Some bridges use this system to bridge across large distances.*

capacitor - *An electronic component used to store electrical charge. They are used in timing and smoothing circuits. Capacitors can also block low frequency signals while passing high frequency. Internal structure is basically two metal plates separated by an insulator or dielectric.*

carbon steel - *All steels contains carbon. High and medium carbon steels can be hardened by heat treatment. Low carbon steels such as mild steel can not be hardened in this way.*

casting - *Molten metals are poured into a mould to form the product. Sand casting of aluminium is performed in school. Pewter is easily cast using MDF or acrylic moulds.*

centre punch - *A tough medium carbon steel tool used to make a dent in metal surfaces. The centre punch is hit using a hammer to make a dent which helps the drill bit start when drilling. A dot punch is used in a similar way to produce smaller witness marks when marking out.*

chisel - *Bevel edge and firmer chisels are used to remove waste wood when cutting joints. Generally used across the grain. Joints should be cut with saw and chisel only - files should never be used.*

chuck - *Chucks are used to hold drill bits. Chucks can be found on portable drills and pillar drills Centre lathes are also fitted with a chuck to hold the work (usually a 3 Jaw chuck but 4 Jaw chucks are used to hold square or irregular shaped work). The tail stock on a centre lathe can have a chuck fitted to hold a drill bit - the work rotates while the drill is held still. A chuck key is used to tighten the chuck however many chucks are now designed to be hand operated.*

circuit - *A circuit in electronics contains components joined by connecting wires; there is usually a switch to turn on the power supply to make the circuit function.*

clamp - *Clamps (cramps) are used to hold work together usually when being glued or welded. Clamps can also be used for temporary fixings when used on jigs for example. Examples of clamps - sash cramps, G clamps, Solo clamps, chair cramps.*

client - *the person or organisation which employs the designer.*

CNC - *Computer Numerical Control - Machines which are controlled by a computer program. CNC Lathes and CNC mills are found in schools. Modern software makes use of CADCAM where the computer converts an accurate drawing into the code needed to operate the machine.*

colour wheel - *a disc with colours in each segment. The wheel shows the primary, secondary, tertiary and complementary colours and can be used to decide which colour scheme to choose when designing.*

comb joint - *Comb or finger joints ares simple square cut interlocking joints used in carcase construction. Typically boxes use these joints as the finished interlocking effect is not only strong but aesthetically pleasing.*

compliant - *term applied to a material which is easy to shape, fold, cut or join*

compression - *To squeeze or squash. Examples of compression forces are found in structures. Concrete is very strong in compression and is used for the parts of buildings and bridges which take the weight such as the pillars holding up floors.*

constraints - *The limits within which a designer has to work.*

consumer - *The person who buys or uses the artefact or service.*

coping saw - *A framed saw with a narrow blade. The blade makes it possible to saw around curves. Used to cut irregular shapes in acrylic, also used to remove most of the waste wood when cutting dovetails or comb joints (after making all the straight cuts with a dovetail or tenon saw).*

corporate identity - *the whole image of the company; especially logos, colours (livery), style.*

cramp - *See clamp*

criteria - *A list of requirements that the design must meet.*

data - *information gathered by investigation (experiments and testing) or research.*

database - *Collected and sorted information held in a filing system. Usually in a computer system.*

design - *A creative process. Producing a final solution through a problem solving creative process of developing ideas within set constraints.*

development - *refining ideas to produce a final solution; taking into account all the constraints of costs, materials, function, manufacturing, aesthetics etc.*

die - *a tool - usually for cutting external (outside) threads. Also applies to moulds as in die casting. and injection moulding dies (especially extrusion), stamps and die cutting.*

die cutting - *Used in the production of nets (packaging) a pattern of razor sharp blades cuts the paper or card into the design. Blunt blades are used to crease.*

dimension - *the size of the object. Adding dimensions to a drawing means to add the measurements.*

dividers - *A marking out tool. Dividers can be used to scribe curves and circles onto hard surfaces such as mild steel.*

dovetail - *The dovetail joint is a very strong joint used in the construction of boxes and drawers. The pins of the joint are splayed out like the tail of a dove.*

dowel - *A piece of wood which is perfectly round in section. Dowels were originally produced to make arrows but are also used to reinforce butt joints.*

drawer - *A sliding box within a cabinet. Usually has a handle at the front and runs on some form of runner.*

durable - *Long lasting even in harsh environments. Foe example an oak post is durable but an untreated pine post is not.*

economies of scale - *The more artefacts are produced the unit cost is reduced. (Development and tooling costs are fixed)*

elastic - *The ability to return to its original shape. An elastic band is a good example. If the elastic limit is exceeded the object is permanently deformed and may break.*

elevation - *A drawing showing one side of a structure.*

embossing - *Paper or card are embossed using a two part embossing die which deforms the paper under pressure to take up the pattern of the die.*

engineer - *A person who works with a range of materials and systems to construct new products.*

engineer's square - *A device used to check for squareness. Engineers squares have a groove to allow for the burr cause when metal is cut.*

ergonomics - *Concerned with the interface between people and products. Products become more comfortable and easier to use when ergonomics is included in the design.*

evaluation - *Critically consider how effective or successful a design is.*

flux - *A chemical which helps to keep the metal surfaces clean and help the solder to flow when heat is applied.*

follower - *a cam follower rests on the edge of the cam and moves up and down as the cam rotates.*

function - *What the product is for ; how it operates. What it does!*

gear- *A toothed wheel which meshes with other gears to transmit motion.*

graphics - *Drawing and illustration.*

hammer - *A tool used to accurately hit against another object such as a centre punch. Hammers are also used for riveting and for banging nails and pins in.*

hand file - *A file which is flat on both sides. It has no teeth on one edge (the safe edge).*

hydraulic - *Hydraulic systems operate by transmitting power and motion using a fluid.*

idler gear - *A gear wheel which is placed in a gear train to reverse the direction of rotation*

input - *An input is where the signal is put into the system. Sensors are good examples of inputs.*

isometric - *A drawing system where the dimensions are not reduced to show a perspective effect. An isometric grid is drawn with lines at 30 degrees and 90 degrees to the horizontal.*

jig - *A device which aids the manufacture of a product or component. Jigs make it possible to produce a series of identical products accurately, for example a drilling jig to produce dowel joints.*

J.I.T. - just in time - *A term used to describe a manufacturing system where components are delivered to the factory as they are needed rather than being stored.*

kiln - *a kind of oven but one which can be used at higher temperatures. Kilns are also used to fire pottery at temperatures over 1000 degrees celsius.*

laser - *Light amplification by stimulated emission of radiation. The laser beam is able to cut through a range of materials as the beam is so finely focused into a narrow beam with high energy.*

L.E.D. - *Light emitting diode. LEDs are used as indicator displays.*

linear - *A straight line. Linear motion is motion in a straight line.*

mallet - *Used with a chisel when cutting joints. The mallet is used to hit the chisel. There are other kinds of mallets used in metalwork.*

market research - *A way of finding out what the possible customers or clients want. Interviews and surveys by questionnaire are the main methods used.*

mdf - *Medium density fibreboard - A man made board material manufactured from soft wood timber which is converted to fine wood fibres. The fibres are bonded together by a thermosetting adhesive compound and then rolled and heat pressed to form a range of board thicknesses - 3mm, 6mm, 9mm, 12mm, 15mm, 18mm.*

mechanism - *A machine. Mechanisms are usually made using levers, gears, cams, cranks, pulleys etc.*

metre - 1000 millimetres - *The basic unit of the metric system of measurement. In D&T all measurements are in millimetres.*

meter - *An instrument for taking measurements.*

micrometer - *An instrument used to measure very small dimensions.*

mild steel - *Low carbon steel. Mild steel is cheap, readily available and easy to form. Widely used in manufacture e.g. car bodies, filing cabinets, white goods casings etc. Must be coated to prevent rust however.*

millimetre - *One thousandth of a metre. The unit of measurement in engineering.*

mitre - *A joint made using a 45 degree angle. Picture frames make use of mitre joints.*

newton - *The unit of force. It is approximately equal to the force exerted by a 100 gram mass on Earth. A bag of sugar exerts a force of approx 10 Newtons due to Earth's gravity.*

oblique - *A drawing system to produce a 3D look. The angle of 45 degrees is used to project the sides of objects.*

O-ring - *A rubber ring used to seal joints especially in pipes.*

orthographic - *a drawing system where three views of the object are drawn - plan, elevation (front view), end elevation. These drawings are dimensioned and can then be used to make the product*

output - *the effect produced by a system. Examples of outputs include sirens, flashing lights, motors being turned on or off, heaters being turned on or off etc.*

permanent fixing - *A joint which once made can only be undone by damaging the product. Welding,brazing and adhesives are usually regarded as permanent fixings.*

perspective - *A drawing system invented in the fifteenth century which makes it possible to represent objects and scenes realistically on paper. Objects are drawn smaller if they are farther away. Use is made of an horizon line and vanishing points to construct the drawings.*

pewter - *Originally an alloy of lead and tin which has a very low melting point. Used for casting small items of jewellery. Pewter tankards used to be very popular. Lead free pewter is now used for most applications. (Modern pewter is an alloy of 92% tin with additions of copper and antimony) Pewter melts at 245 degrees C.*

pic chip - *A programmable chip which enables control circuits to be quickly designed and manufactured.*

pillar drill - *a power drill which is mounted on a strong steel pillar bringing it to chest height. The pillar drill can drill accurately and perfectly vertically. A depth stop can also be used to control the depth the hole is drilled to.*

planning - *A step by step set of instructions describing how to manufacture the product. A flowchart is an effective way of presenting the plan. Good planning will reduce wasted time and mistakes.*

polyethylene - *A thermoplastic used to make carrier bags, food bags, plastic buckets etc. It is flexible, has a waxy or slippery feel and is slightly cloudy when in transparent form.*

polypropylene - *A thermoplastic similar to polyethylene but is generally tougher. Used to make folders, suit cases etc. This plastic can be bent repeatedly without breaking - hinges can be made from the same plastic as the rest of the product.*

printed circuit board - *A circuit board where the design for the connections is produced by a photographic process followed by etching to remove the unwanted copper. Holes are drilled and the components can then be soldered into place.*

pulley - *A wheel with a groove in its edge, A belt runs in the groove and connects up to two or more other pulleys. Power is transmitted by this system.*

PVA - glue - *An adhesive made from a water soluble plastic (polymer). When the water evaporates the plastic forms strong bonds joining the materials together.*

quality - *How well made and effective the product is. Quality assurance during manufacture is essential and is carried out by regular testing against specification criteria. Quality control is the name given to the testing and correction procedures when manufacturing*

quality assurance - *See quality*

questionnaire - *A survey where a series of questions are asked and the answers are recorded systematically on a form.*

raster - *To scan an image line by line. A TV picture is built up in this way. When the laser cutter engraves it rasters the image.*

resistor- *A electronic component which has a resistance. These resistors are mass produced and their individual resistance is recorded on them by a series of coloured bands. The value can be decoded using the "Resistor Colour Code"*

router - *A power tool used in woodwork. The cutting bit revolves at very high speed and can be used to cut grooves, rebates and decorative mouldings on timber.*

safety - *Very important in the workplace, especially where machinery is being used. Safety rules deal with the correct use of equipment and the way to behave. Protective clothing is an important part of safety. Products must be safe in use - no sharp or small parts, strong enough so that they do not break dangerously in use, non toxic paints etc.*

scissors - *A tool used for cutting paper and fabrics. Scissors cut by using a shearing force. Well designed scissors should be ergonomically designed and safe to use.*

scriber - *A sharp pointed tool made from hardened medium carbon steel. It used to mark out on metal surfaces by leaving a scribed line. Best used with layout blue so that the scribed silver line stands out against the blue background.*

shear - *A force applied to a materials as two cutting blades cross past each other. Scissors and garden shears are good examples.*

sensor -*A device which detects a change in the environment and produces an electrical signal. Light sensors and pressure pads are good examples. Sensors act as inputs to a system.*

silver steel - *High carbon steel which also contains chromium. Can be hardened and tempered.*

solder - *Originally an alloy of tin and lead, now most solders are lead free. An alloy of mostly tin with some silver and copper which has a low melting point. Used in electronics and plumbing to join components together. Solder gives a very good electrical connection. Cleanliness and flux are essential for a good joint as well as the correct use of heat.*

specification - *A list of features that a product should have.*

spur gear - A small gear

steel - *An homogenous mix of iron and its alloys with carbon.*

stepper motor - *A motor which moves an exact number of degrees when it receives a signal. Controlled by a microprocessor circuit, stepper motors are widely used in CNC machines and robots.*

survey - *Gathering information by asking a wide range of people what their opinion is of a product or service.*

system - *A system is made up of a series of stages. In its simplest form there are three stages - INPUT, PROCESS, OUTPUT. Feedback from the output back to affect the input is often incorporated into a control system.*

template - *a pattern or gauge used when marking or cutting out. Templates can be used in one off or batch production using paper or card but for longer runs a more durable template is needed e.g. plastic or metal.*

tenon - *A part of the mortise and tenon joint. The tenon is the pin. A tenon saw is a backed saw used to do straight cuts as when cutting tenons.*

tensile - *Tensile strength is the ability to resist the force of tension or being stretched.*

tension - *A stretching force. In a suspension bridge al the cables are in tension.*

Tensol Cement - *An adhesive used to join acrylic to acrylic. It is a solvent weld adhesive as it dissolves the surface layers and then bonds as the solvent evaporates. The solvent (dichloromethane) can be used by itself but evaporates very quickly making it tricky to use.*

testing - *To try out in the situation the product was designed for. Testing takes place against the points listed in the specification.*

thermoplastic - *Polymers or plastics which soften or melt when heated.*

thermoset - *Polymers which once set cannot be reformed using heat.*

thyristor - *an electronic device which can act like an electronic gate.*

toggle clamp - *a clamp which once operated cannot be released at the clamping end but only at the handle end.*

tolerance - The range or allowance permitted when manufacturing a product. Usually to a physical measurement.

transistor - *An electronic device which can be used as an electronic switch or as an amplifier.*

try square - *An L- shaped tool which is used to check for squareness.*

vacuum forming - *The process of forming (reshaping) a thermoplastic such as HIPS over a former or mould. Heat is used to soften the polymer and then a vacuum is used to draw the polymer (plastic) down onto the former*

variable resistor - *An electronic component where its resistance can be adjusted. Potentiometer is another word for a variable resistor. Presets are designed for occasional adjustment especially when setting up the circuit.*

vector - *Vector graphics are recorded as points and lines. Most CAD programs record the drawings by a form of vector graphics.*

weight - *Measured in grams. Weight is a force due to the attraction of the Earth's gravity on the object.*

X - axis - *If drawn on paper this axis would run across the paper in a horizontal direction.*

Y - axis - *This axis has a vertical direction on paper.*

Z - axis - *On paper the direction of this axis would be coming out of the paper or going down through the paper for negative values.*