Year11 term 1: NEA material properties resources

Natural wood is catergorised as **hardwood** or **softwood.** These names reflect the cell structure of the tree and not the strength of the wood.
Hardwoods generally have a less porous and denser cell structure than softwoods. This makes many varieties harder wearing and less prone to rotting. If left unprotected from the elements, **softwoods** can absorb moisture and begin to rot.

Hardwood is from a *deciduous* tree (a tree that drops its leaves in winter). Hardwoods can take hundreds of years to reach maturity.

Softwood is from a *coniferous* tree (a tree that bears needles and has cones). Softwoods can reach maturity in around 25 years.

Manufactured boards are usually sheets of processed natural timber waste products combined with adhesives. Manufactured boards have a pale brown natural finish, but can be covered with thin slices of high quality wood to give the appearance of solid wood. This covering is called a **veneer.**

Hardwoods	Properties	Uses
Ash	Flexible, Tough and shock resistant, laminates well.	Sports equipment and tool handles.
Beech	Fine finish, tough and durable.	Children's toys and models, furniture and veneers.
Mahogany	Easily worked, durable and finishes well.	High end furniture and joinery veneers.
Oak	Tough, hard and durable, high quality finish possible.	Flooring, furniture, and veneers.
Balsa	Very soft and spongy, very lightweight but can snap in thin sections.	Prototyping and modelling – especially model aircraft.
Softwoods	**Properties**	**Uses**
Larch	Durable, tough, good water resistance, good surface finish and machines well. Issues with loose knots. Untreated will last approximately 30 years outdoor.	Exterior cladding, flooring, machined mouldings, furniture and joinery.
Pine	Lightweight, easy to work, can split and be resinous near knots.	Interior construction (and exterior treated), cheaper furniture, decking.
Spruce	Easy to work, high stiffness to weight ratio. Variable results when staining.	Construction, furniture and musical instruments.
Manufactured Boards	**Properties**	**Uses**
Medium Density Fibreboard (MDF)	Rigid and stable, good value with a smooth easy to finish surface. Very absorbent so not good in high humidity or damp areas.	Flat pack furniture, toys, kitchen units and internal construction.
Plywood	Very stable in all directions due to alternate layering at 90°, with outside layers running in the same direction. Thin flexible versions available (flexiply).	Furniture, shelving, toys and construction. Interior and exterior and marine grades available for greater water resistance.
Chipboard	Good compressive strength, not water resistant unless treated, good value but prone to chipping on edges and corners.	Flooring, low-end furniture, kitchen units and worktops.

Use the materials research to select an appropriate material or you client's product. This must be used in your manufacturing specification
The properties of a material will also be evidenced in your materials research.

You need to be clear the choice of a material is not random but considered. You have selected for a reason.

Ferrous Metals	Properties	Uses
Low Carbon Steel (Mild Steel)	Tough and ductile, easily machined, formed brazed and welded.	Construction girders, screws, nails, nuts and bolts. Many car bodies and bike frames.
High Carbon Steel (Tool Steel)	Less ductile and harder than mild steel due to higher carbon content. Very hard wearing and keeps an edge well.	Garden or workshop tools, blades, scissors, wood and metal cutting tools.
Cast Iron	Hard but brittle in thin sections. Easily cast into complex shapes, but some types are hard to machine.	Kitchen pots and pans, machine bases and bodies, vices, manhole covers, post boxes.
Non-Ferrous Metals	**Properties**	**Uses**
Aluminium	Lightweight, high strength to weight ratio, ductile but can be difficult to weld.	Pots and pans, sports car body panels, bike frames, drinks cans, foil or take-away trays
Copper	Ductile, malleable and a good electrical conductor that is easily joined by soldering.	Plumbing supplies, electrical cables, bespoke roofing and guttering.
Tin	Soft, malleable and ductile; a good electrical conductor.	Can production.
Zinc	Fair electrical conductivity, malleability and ductility; however, all are improved when alloyed.	Mainly used to **galvanise** steel to prevent rusting, easily die cast or used in alloys.
Alloys	**Properties**	**Uses**
Brass	A heavy alloy of Copper and Zinc that is malleable, easy to cast and machine and has naturally low friction.	Musical instruments, bushes, plumbing fitments, ornate artefacts and hardware.
Stainless Steel	A ferrous alloy with chromium, nickel and manganese. Hard, very smooth, difficult to weld.	Cutlery, kitchen and medical equipment.
High Speed Steel Alloys include: Chromium Tungsten, Cobalt.	Able to withstand the high temperatures created when machining at high speed, keeps its cutting edge well.	Cutting tools such as drill bits, mill cutters taps and dies.