Joining Materials

- The student will learn about...
  - The methods by which materials are joined – permanent and semi-permanent techniques
- The student will be able to...
  - Demonstrate a knowledge of the main methods of joining materials – metallurgical processes, mechanical joining and adhesive/chemical bonding
Joining metals

- When joining material we can temporarily join them with nuts and bolts or screws, or else permanently join them by welding, riveting, brazing or gluing them.
Screws

- Screws are used for joining parts together. They do not need a nut to hold the pieces together but a nut can be used if needed. Below are some examples.

<table>
<thead>
<tr>
<th>Hex head</th>
<th>Grub screw</th>
<th>Cheese head</th>
<th>Round head</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
</tbody>
</table>
Nuts and bolts

- Unlike a screw, a bolt needs a nut if it is being used to join two pieces together.
Nuts

- Nuts are used with screws and bolts to hold pieces together. Below are some examples.

<table>
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<th>Wing nut</th>
<th>Lock nut</th>
<th>Castle nut and pin</th>
<th>Plain Hex nut</th>
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Washers

- Washers are put on before a nut to stop the piece getting scratched when tightening the nut.
Riveting

- Riveting is a permanent way to join parts together.
- The most common form of riveting is pop riveting.
- Pop rivets are useful for joining light materials.
Riveting

- The pop rivet fits into the riveter and when the handles are squeezed together the head of the rivet expands.
- After two or three squeezes the head snaps off the pin and the pieces are then held together.
Wood joints

- Joints are used to build strength into products. The joints below are the joints that are commonly used in schools. Note only glue is used to join these joints together.
Butt joint

- A very simple joint but it is also very weak. They tend to be used for making picture frames, corner pieces and nails are often used to strengthen the joint.
Mitre joint

- Mitre joints are often used to produce the corners of picture frames and boxes. The mitre needs to be cut at a 45 degree angle.
Halving joint

- There are many versions of the halving joint but they all involve removing half of the wood from each piece using a saw or a chisel.
Mortise and tenon joint

- This is a very strong joint. The joint is split into two parts; one part is the tenon, the other part is the mortise.
Dowel joint

- This joint is quite easy to make, it consists of drilling accurate holes in both sections of wood and joining them with dowel pegs. Within in industry this is often used to construct flat pack furniture.
Dovetail joint

- Noted for its resistance to being pulled apart the dovetail joint is commonly used to join the sides of a drawer to the front.
Housing joint

- This is just a simple slot cut into one piece of wood to increase the glue area. This is often done with a router and works very well in MDF.
Finger joint

- The only joint that is stronger is the dovetail joint. The finger joint can be difficult to make but looks very good. It has a lot of surface area to glue together.
Soldering

Electric Soldering Iron

- Electric Cable
- Insulated Handle
- Replaceable Tip

Electric Soldering Iron
Soldering

Soldering Iron Holder

Soldering wire reel
Soldering a component on a circuit board

The soldering iron tip is placed against the lead and the circuit board foil. Both are heated for 3 or 4 seconds.
Soldering a component on a circuit board

The solder is applied to the lead opposite the soldering iron. It is the heated lead and circuit board foil that melts the solder.
Soldering a component on a circuit board

As the solder melts it flows around the connection and forms a good conductive joint with the foil. The soldering wire and the soldering iron are then withdrawn and the joint is allowed to cool.