Joinery

- The process of connecting or joining two pieces of wood together through the use of various forms of wood joints.
- In basic materials processing, common forms of joinery include dovetail joints, mortise-and-tenon joints, biscuit joints, lap joints, and spline joints.

Butt Joint

- An easy but often weak technique for joining two boards together simply by gluing and pressing two flat surfaces together.
- Typically made by gluing an end to an adjoining flat surface.
Biscuit Joint

- A butt joint that is reinforced with football- or lozenge-shaped wooden "biscuits."
- Biscuits are usually made from compressed wood, frequently birch wood.
- When the biscuit comes into contact with glue in the biscuit slot, it swells thus creating a tighter joint.
- Sometimes called a plate joint.

Dado Joint

- A joint where one piece is grooved to receive the piece which forms the other part of the joint.
- **Dado (definition)**
  - A groove which is cut across the grain to receive the butt end or edge of a second piece.

Dovetail Joint

- Joining two boards in which alternating slots (or tails) and protrusions (or pins), each resembling in shape the v-shaped outline of a bird's tail, are snugly fitted together, thus increasing the gluing area.
- Produces a joint that, even without glue, can be difficult to pull apart.
- Regarded as one of the strongest and most reliable forms of wood joinery.

Lap Joint

- A joint where one piece of wood is crossed over another.
Miter Joint

- The woodworking joint created when two boards are cut at an angle to one another.
- The most common miter joint is the 45-degree miter such as the cuts used to build square or rectangular picture frames.

Mortise-and-Tenon Joint

- A joinery technique where the cut end (tenon) from one board fits into the matching opening (mortise) of another.
- Mortise (definition)
  - An opening chiseled, drilled or routed into a board to receive the end of an intersecting board.
  - The opening or socket that receives the tenon in the classic woodworker's mortise-and-tenon joint.
  - The female part of a mortise-and-tenon joint.
- Tenon (definition)
  - The end of a board, cut to a specific size and shape, that is inserted into the mortise, or opening, in a second board.
  - The male part of a mortise-and-tenon joint.

Rabbet Joint

- A joinery technique where an “L” groove across the end of the edge of one piece of wood fits into a edge or end of another board with an “L” groove.
- Rabbet (definition)
  - A rectangular, stepped recess cut along the edge of a section of wood. (May be used as a verb or noun.)

Scarf Joint

- A joinery technique where two wedge-shaped pieces have been cut to correspond to one another.

Finger Joint

- A joinery technique used mostly in industry where small “fingers” are cut into corresponding pieces that will be joined together.

- Finger joints are used to making wide boards, in extending the length of dimensional lumber, and in laminated construction.

Joinery Reinforcements

- **Key (or Biscuit)**
  - A small, flat lozenge-shaped dowel for edge or corner-jointing. Wood biscuits are fitted into slots that are created with a biscuit jointer.

- **Dowel pin**
  - Pegs of wood that fit into two matching holes to strengthen a joint.

- **Spline**
  - A thin piece of wood that fits in the mating grooves cut into two pieces of wood.

Wood Fasteners

- What fastener is best to use?

- There are a few questions you need to ask to determine which type of fastener you need to use.
  - What materials need to be joined? Wood, metal and masonry all require different fasteners.
  - What is the thickness of the material to be joined? For a secure connection, the fastener must be the correct length.
  - What weight or strength requirements are there? From framing a house to hanging a picture, there’s a fastener for the job.
  - How permanent will the connection be? If the work will be disassembled at some point, use a screw.
  - Will the work be indoors or outdoors? There are specific fasteners for both types of applications.

Nails

- The nail has been around for thousands of years.

- The first versions were heat-forged. When machinery entered the picture, they were cut from sheets of metal.

- Today, most nails are drawn and cut from rolls of wire.
Nail Size

- Nails are sold by weight or length.

- Wood nails are measured, or sized, according to length. This is expressed by the letter “d” (called penny). The symbol is English, signifying a pound in weight, related to the weight in pounds of 1000 nails. Sizes run from 2d (2-penny/1” long) to 60d.

- Nails generally are 1” to 6” in length, usually getting thicker as they get longer.

- Nails larger than 6” are sometimes called spikes.

Nail Styles

- Nail points vary, but the four-sided diamond point is the standard point found on most nails.

- Nail heads also vary. Smaller heads can be driven in and painted over. Large framing nails have corrugated heads to reduce the danger of a hammer slipping and causing injury or damage.

- Regular wood nails are often referred to as wire nails.

Common Nail

- Thick, heavy-duty, general-purpose nail.

- Large, flat head for performing rough work such as construction framing.

Box Nail

- Short, thin shaped nail with a blunt tip.

- Used to fasten smaller stock when common nails are too large.
**Finishing Nail**
- Small nail with cupped head for fastening trim when nail heads should not show.
- Can be countersunk with a nailset, then filled over.

**Brad**
- Smaller version of the finishing nail up to about 1” long.
- Used for detail work such as attaching molding or trim.

**Casing Nail**
- Similar to finishing nail, but thicker and heavier.
- Used to attach case molding or rough trim where strength and concealment are required.

**Tack**
- Very short nail with relatively large head and very sharp point.
- Used to fasten upholstery or carpet or to perform other light fastening jobs.
Upholstery Tacks

- Short nails with ornamental or colored heads.
- Used for attaching upholstery where fasteners will show.

Screws

- For fastening, screws are stronger than nails.
- They can be removed with less damage to the material (especially wood) than nails.
- When using with wood, best practice is to pre-drill a “pilot” hole to guide the screw into position.

Screw Slot Types

- Slotted
  - Conventional single-groove screwhead.
  - Applied with a flathead screwdriver.
- Phillips
  - Cross-slotted screwheads with U or V-shaped slots of uniform width.
  - Driven with a Phillips screwdriver.
- Torx™
  - Require special drivers with six point heads.
  - Commonly used in electronics, metal or automotive applications.

Screw Head & Thread Types

- Head Types
  - Oval
    - Lower portion is countersunk and top is rounded.
    - Easier to remove & better looking than flathead screws.
  - Round
    - Used where the fastened piece is too thin to permit countersinking.
    - Also used on parts that may require a washer.
  - Flat
    - Used in applications where the head needs to be flush with the surface.
    - Slotted and Phillips type are available.
- Thread Styles
  - Fine-thread
    - Work best for hardwoods.
  - Coarse-thread
    - Intended for soft woods.
Wood Glues & Adhesives

- By definition, glue is made from animal byproducts such as skins and bones.
- An adhesive is any product that joins materials together.
- Today, the words "glue" and "adhesive" have become interchangeable.
  - Natural Glues are made from animal byproducts (hide glue and casein) or plant sources (paste, cellulose and rubber).
  - Synthetic Adhesives include polyvinyl acetate (PVA), aliphatic resin, contact cement, hot melt, and polyurethane.
- Whether natural or synthetic, the bond is formed as the liquid dries and hardens.
- Adhesives are often used in conjunction with fasteners to strengthen wood joints.

Animal Glues

- Used mostly for furniture making and woodworking.
- They are easy to work with, but less resistant to heat or cold.
  - Hide glue
    - Made from bones, hoofs and skin from animals and fish.
    - Dry form is mixed and heated (in a glue pot) into a gelatinous mixture that is applied with brush.
  - Casein
    - Made from milk, powdered and reformulated with water.
    - Creates a waterproof bond.

White Glue
(polyvinyl acetate)
- For wood, engineered wood, paper, crafts and simple projects.
- Most commonly available in plastic squeeze bottles.
- Begins to set within one hour, dries clear.
- Has easy clean up, doesn’t stain, nontoxic, nonflammable.
- Is not waterproof.
- Requires work to be clamped for best results.

Yellow or Carpenter’s Glue
(aliphatic resin)
- For woodworking.
- "Refined" version of PVA.
- Packaged in squeeze bottles.
- Varieties typically come in yellow or brown.
- Begins to set within 15 minutes.
- Water-resistant nontoxic, nonflammable.
- More resistant to temperature and water than white glue.
- Work needs to be clamped for best results.
- Used for indoor and outdoor applications.
Contact Cement

- For bonding wood veneer and plastic laminates to countertops.
- Water-resistant.
- Applied to both surfaces needing to be bonded.
- After a designated curing time, the two work pieces are put together.
- Forms an instant bond, leaving no margin for error.
- Water-based versions are nonflammable.

Hot Melt

- For crafts, general projects and repair.
- Requires an electric glue gun.
- Adhesive is a 2-4" glue stick that is inserted into the gun. Heat converts solid to liquid for application.
- Begins to set in about a minute as it cools and solidifies.
- Fills gaps for good adhesion.

Polyurethane

- For woodworking.
- Synthetic plastic-based material.
- Requires moistening of one or both sides of the materials to be joined.
- Creates a strong bond.
- Can be difficult to clean up.