

Non-credit Class for UAF Summer Session 2008

Can You Cut It? Essential Information for the Woodworker

One way or another, most of what a woodworker does is cut wood.

In order to cut cleanly and efficiently, it is important to know the theory of how tools work and like any musical instrument, how to tune them. Whether splitting, chopping, sawing, planing, boring, carving, scraping or abrading it is essential that the cutting edges be appropriately shaped and sharpened.

For the beginner I hope to start you on the right foot and save you many frustrating hours of evolution. For the intermediate and advanced I hope to expand on what you know and uncover some new treasures and techniques.

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Woodworking has been my profession for over 36 years, most of which has been cabinet and furniture making and architectural woodwork. My involvement in woodworking dates back to grade school. I am for the most part self-taught with the exception of a semester at the Wendell Castle Workshop in New York, numerous weekend workshops and the influence of peers and mentors.

Course Outline “Can You Cut It?”

Friday, August 15 – 6pm to 8:30pm

- I. Basic Steps of Any Woodworking Project
 - A. Concept/design/cut list (Head scratching – this will be an overview. We will cover details on Saturday and Sunday)
 1. Concept – what is the object or form and what is the motivation behind it
 - a. Purely conceptual
 - Bowl from a log
 - A willowy/curvy/airy form with no particular function
 - Sculptural object as a chair
 - b. Technique or material driven (found object)
 - Dovetail box from a unique board
 - Specific tool
 - Specific technique

- c. Problem solving
 - Cabinet from lumber and plywood
 - Stores a particular object
 - Fits into a particular space
- d. Most projects are a blend of a, b and c
 - “a” because we want to imply an aesthetic in most of what we make
 - “b” because we all have limited space, time, tools, knowledge and skill
 - “c” because most of what woodworkers make serves a function

2. Design

- a. Sketches, models, mock-ups, representative pictures of existing pieces, actual object as inspiration
- b. Scale or full size drawings verify proportions, details, joinery and look for pitfalls
- c. Cut List
 - Efficient machine time
 - Best use of material
 - Organization can reduce errors
 - Helps when you buy materials

B. Material from a tree or supplier (Head scratching)

- 1. Select appropriate material
 - a. aesthetic
 - b. structural
 - c. availability & cost
- 2. Wander and wonder in the woods
 - a. know what your seeing
 - b. know how to harvest and process it

C. Control parameters of the material (From here on it's all about sequencing, quality control and efficiency or time and motion. Does not necessarily imply that you're done head scratching))

- 1. Select for color, texture and character
- 2. Select for quality
 - Defects – cheques, rot, loose knots
 - Reaction wood
- 3. Stability
 - Moisture content
 - History of board
 - Future of project
- 4. Reference surfaces (rough out first?)
 - Reference face, edge and end
 - Flat and true

- Square and dimensioned

D. Sizing, shaping and joinery

1. Thickness, width and length
 - Include dangling hidden parts
 - Include sacrificial handles for later as needed
2. Shaping
 - Curves, tapers, sculpting, etc.
 - Edge treatments
 - Sequence with joinery
3. Joinery
 - All joints cut and tested
 - Facilitate hardware attachment and maybe attach it

E. Assembly

1. Dry fit
2. Make assembly plan
3. Pre-assembly detailing
4. Glue up

F. Finish

1. Final clean up and detail out
2. Apply finish

II. Basic Characteristics of Wood

A. Physical properties

1. Morphology of a tree and a saw log: following the fibers
 - Bundle of fibers wrapped in bark
 - Annual rings
 - Rays
 - Limbs and knots
 - Inclusions
2. The cells of fiber and the tricky things they do
 - Sap wood, growth and rate of growth
 - Heart wood: deposition, hardening, color and decay
 - Reaction wood or how to deal with gravity and wind
 - Spiral grain
 - Curly grain
 - Death, dying, cracking and relaxing (spalting, blue stain, cracks)
 - Contraction, expansion and it never ends
3. Moisture content and regional stabilization point (Equilibrium moisture content)
4. Why on earth do we need to know all this junk?
 - Ever-changing size: tangential, radial, longitudinal
 - Changing shape: twist, cup, sweep and differential shrinkage
 - Checking

- Receptiveness for glues and finish
- B. Making lumber from a tree and orientation of a plank in a log
 1. Tangential or flat sawn
 2. Radial, quarter sawn or vertical grain
 3. Rift sawn
 4. Oblique
 5. Transverse or cross-section

III. Physics of Cutting

- A. Two sweeping generalizations about cutting tools
 1. Self guided: planes, spokeshaves, mortise chisels, power plane, jointer and planer, table saw
 2. Hand guided: paring chisels, draw knives, carving tools, grinders, jig and scroll saws
- B. Orientation to grain and plan ahead
 1. With the grain
 - Splitting or riving
 - Cutting
 2. Against the grain
 3. Across the grain
 4. Curly and knots
- C. Cutting angle and braking chips
 1. Planes and chisels
 2. Carving tools
 3. Ax and adz
- D. Sawing – crosscut vs. ripping

Saturday and Sunday, August 16 & 17 – 9am to 4pm

- I. Work surfaces and how to hold things down
 - A. Work Benches
 1. Euro style
 2. Low bench/high bench
 3. Shaving horse
 4. Horses and worktables
 - B. How to hold things
 1. Applied fat
 2. Vises
 - Front
 - Tail
 - Pattern makers
 - Carvers vise
 3. Bench dogs, wedge and dogs, holdfast & “V” blocks
 4. Hand screws & clamps

II. Enumerate and define essential hand tools and how they relate to their electric cousins

A. Layout tools

1. Tape measures, rules, dividers and calipers – precise vs. consistent
2. Squares
 - Framing and speed squares
 - Try squares
 - Combination squares
 - T-square
3. “T” bevels, protractors and the mix
4. Straight edge and winding sticks
5. Pencils, scratch awls and marking knives
6. Marking gauges
7. Scribes, compasses and trammel heads
8. French curves, flexible curves and battens
9. Levels and plumb bobs

B. Cutting tools

1. Hand tools

a. Planes

- Smooth, bench, jack, fore and jointer
- Block
- Scrub
- Finger
- Rabbit and chisel
- Plow and router
- Compass
- Moulding

b. Spoke shaves and draw knives

- Flat
- In shave or round face
- Radius in and radius out
- Draw knives
- Push knives

c. Scrapers

- Hand held scrapers
- Scrapers on handles
- Scraper planes
- Scratch stocks or beading tools
- Dowel formers

d. Chisels

- Butt
- Paring, firmer, cabinet, bench
- Mortise
- Skewed, cranked, swan neck and corner
- Framing

- Socket vs. tang
- e. Saws
- Coping, fret and jewelers
 - Key hole
 - Back
 - Cross cut and rip
 - Japanese style pull saws
 - Hole saws
- f. Drills
- Twist
 - Brad point
 - Forstner and multispur
 - Augers
 - Specialty
 - tapered
 - stepped
 - hollow
 - tennon and plug cutters
 - counter sinks and pointers
 - circle cutters
- g. Abrasives
- Files and rasps
 - Sand paper and holding devices
2. Hand held power tools
- a. Circular saw
- b. Jig saw
- c. Power plane
- d. Sander
- Orbital
 - Belt
 - Disc
- e. Drills and drivers
- f. Routers
- Laminate and trim
 - Fixed base
 - Plunge
- g. Biscuit joiners
- h. Grinders
- Angle grinders
 - Rotary tool – freedom and die grinder
3. Stationary power tools
- a. Jointer
- b. Planer
- c. Table saw
- d. Band saw
- e. Scroll saw

- f. Shaper
- g. Sanders
 - Dimensional
 - Platten
 - Disc and belt
 - Edge
 - Drum
 - Spindle
- h. Drill press/boring machines

C. Assembly tools

1. Clamps
 - a. Bar
 - b. Pipe
 - c. Spring
 - d. Edge
 - e. Mitre
 - f. Band and inner tube
 - g. Pinch dogs
2. Vacuum press
3. Cauls, plattins, blankets and forms
4. Clamping tricks
 - a. Hot melt and sand paper blocks
 - b. Edge, corner and cork blocks

III. Tuning and sharpening

- A. The basic cutting edge
 1. Definition: the juncture of two planes usually meeting at 90 degrees or less
 2. The nature of a cutting edge depends on the texture and shape of the two joining surfaces
- B. Sharpening
 1. Planes and chisels
 2. Scrapers
 3. Knives and carving tools
 4. Saws
 5. Drills
- C. Tuning up
 1. Hand planes
 2. Jointers and planers
 3. Table saw

IV. Joinery

- A. Using hardware
 1. Screws, nails and staples
 2. Euro screws and face frame or pockethole screws
 3. Knock down

- a. Tee nuts
- b. Barrel nuts
- c. Threaded inserts
- d. Mini fix
- 4. Brackets
- B. Glue joint
 - 1. Face or laminate
 - a. Veneer
 - b. Stack laminate
 - c. Brick lay
 - 2. Edge
 - 3. Scarf
- C. Mechanical
 - 1. Dado and rabbit
 - 2. Tongue and groove/mortise and tenon
 - a. Half lap
 - b. Bridle
 - c. Through
 - d. Wedged
 - e. Foxtail wedged
 - 3. Dove tail – sliding, through, halfblind and blind mitered
 - 4. Biscuit/spline
 - 5. Dowel/loose tenon
 - 6. Finger joint
- D. Joinery on difficult shapes
 - 1. Leave reference surface attached
 - 2. Attach shape to reference surface
- E. Curved surfaces
 - 1. Form and blanket or male or female
 - 2. Vacuum press
 - 3. Free form with rubber straps
 - 4. Cold mold
 - 5. Uses of Italian bending poplar, kerf board, wiggle board
 - 6. Brick laying and shape later

V. Assembly

- A. Glue
 - 1. White and yellow glues
 - Elmers white
 - Yellow or “woodworker glue”
 - Titebond I, II, III
 - 2. Resorcinol and plastic resin
 - 3. Hide glue
 - 4. Epoxy
 - 5. Contact cement
 - 6. Hot melt

7. Adhesives and mastics

B. Pre-assembly steps

1. Dry fit

- Verify fit for all pieces
- Look for pit falls
 - Assemble all at once or in stages
 - Are there anything that need to be done before assembly
 - Figure out clamping needs
 - Will I need help?
- Think about sequence and make a glue up plan
- Get your ducks in a row: clamps, blocks, glue, wax paper, etc.

2. Pre-assembly detailing

- Clean up and finish where necessary
- Details that may be difficult or impossible to achieve once assembled
 - soften inside edges
 - shelf peg holes
 - holes for wires or ventilation
 - tool clearance for further steps
 - difficult inside finish
- Install hardware
 - drawer slides
 - touch latch for drawers

C. Glue up and clamp

1. Appropriate glue amount, application and resist if necessary
2. Protect surfaces from clamp scarring
3. Clamp at appropriate points and with appropriate pressure

D. Check for square, flat, straight and parallel. Clamping pressure can easily cause distortion

E. Clean up

1. Clean warm water
2. Cotton rags – not syntho
3. Scotch brite
4. Thin stick for corners

VI. Finish

A. Final clean up and detail out

- Raised grain
- Glue zoobies
- Gaps
- Nail and screw holes
- Surface treatment
 - Scraping
 - Sanding
 - Steel wool
 - Burnishing

- Add texture (wire brush, sandblast, hammer, chain and stamp)
- Get rid of texture with grain filler or sanding sealer
- Auto body bondo and spot putty

B. Apply finish

- Natural
 - oil base
 - water base
 - surface coat
 - penetrating
 - wax
- Mess with the color
 - fume
 - dye
 - stain and pre-stain
 - ebonize
 - air brush colors
 - paint
 - shoe polish