Bakersfield College  
Fine Woodworking  
Mr. S. J. Hageman, M.A.  

Grade: 1 2 3 4 5

BC WOOD Cross-curricular Rubric

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WEEKLY JOURNAL ENTRY

CLASSROOM LECTURE / DEMONSTRATION NOTES:

Week 1: Jan. 22
Browse=just look through the chapter/take few notes
Review=skim/take some notes
Read=read conscientiously/take good notes
Read/Questions= be very serious/take comprehensive notes, and copy and answer questions

DIMENSION—listed in this order: pieces, thickness, width, length

NET=net dimension of the finished product

RGH=rough dimension

The rough top for our project is 1 – ¾ x 17¾ x 25½

Week 2: Tues. Jan. 27
Lecture on Chapter 10-11 (I’ve included comments from the lecture with the journal entries for chapters 10 and 11 from the text. See page 4-7 of journal.)

Week 2: Thurs., Jan. 29
Demonstration of table saw, jointer, and surfacer/planer

Textbook Chapter: 18  
Pages: 267-280

Accidents result from unsafe acts and hazardous conditions:

UNSAFE ACTS

CARELESSNESS—Do not try to perform a task without proper training or planning. Read about the process, watch someone perform the task, and ask questions if you do not understand.

STRESS—Do not work while under physical or emotional stress.

DISTRACTIONS—Do not distract others.

TOOL HANDLING—Tools should be handled properly (i.e. carry tools by handle, never in pockets, make sure tools are in good condition, do not carry power tools by
the cord, make sure cords are properly grounded, keep hands away from moving parts, use trigger locks, etc.)

HANDLING MATERIALS—Lift with knees bent, keeping your back straight, and get a second person to help you move large or heavy objects to prevent back injury.

HAZARDOUS CONDITIONS

WALKING/WORKING SURFACES—Clean debris from surfaces, keep work area clean, use nonskid mats, keep walkways clear, etc.

FLAMMABLE LIQUIDS are classified by the flash point (minimum temperature that could cause a fire). Ground containers with copper wire when storing flammable liquids and only use approved safety cans for storage because the safety cans have flamer arrestors and spring loaded lids.

EXHAUST/VENTILATION systems reduce dust and particles and remove harmful vapors.

FINISHING ROOM—Use respirators, explosion proof light fixtures, and fans. Keep containers covered and labeled, and keep soiled rags in approved containers to prevent fire.

ELECTRICAL—Label voltages. Inspect cords. Prevent shock by using double insulated tools with polarized two-prong plugs. Use ground wire when necessary. Inspect outlets for proper grounding with a tester. Never use a 3-pronged plug with a damaged or missing ground prong. Use the proper plug with the appropriate outlet. Use 30psi on air hose when using it to remove dust. Inspect hoses and couplings, and be sure air lines and pressure tanks are free of moisture.

FIRE PROTECTION The shop should be equipped with fire extinguishers, fare alarms, and sprinkler systems, and you should know how to use the fire extinguishers and which fire extinguishers is appropriate for a given fire.

PERSONAL PROTECTIVE EQUIPMENT protects people from harmful substances. Use respirators as necessary and gloves for handling rough lumber or harmful liquids (but remove gloves before operating machinery!) Proper shoes protect the feet. Safety glasses should be worn. Ear plugs protect the ears from overexposure to noise. Clothes should not be loose or baggy. Remove jewelry.

MECHANICAL GUARDING should cover moving parts to protect the user. Types include point-of-operation guards which protect hands/body from cutting tool, enclosure guards which cover moving parts (such as the motor of the tool, etc.), interlocking guards which prevent machines from operating while dangerous parts are exposed, automatic guards which raise as the material is pushed through the point of operation, and specialized remote control guards.

"Keeping Ten Fingers” supplemental article

This article took a look at over 1,000 surveys about serious injuries related to the use of woodworking tools. The author acknowledged that some of the highest incidents of injury on a particular tool did not necessarily mean that said tool was inherently more dangerous, but that it was more widely used. Anyway, his point was to show what bad habits led to the most serious types of injuries and to expose the best ways to prevent such accidents. Table saw injuries were most common when the worker attempted to rip short, narrow, or thin pieces of wood; in addition, ripping knotty, warped, or checked lumber led to accidents. Most of the serious accidents reported resulted—or proved to cause a more serious injury—when the guards were off. The author suggests always using the guards and push sticks,
never putting your hand in line with the blade, plan ahead so that you do not need to rip small pieces, and do not rip warped or knotty pieces on a table saw. Joiner accidents also occurred most frequently when trying to mill stock that was too small. Instead, the author suggests using a hand plane for short pieces and to joint stock before cutting it into small pieces.

**Textbook Chapter: 7**

Working drawings contain drawings and specifications for a project. They include views and dimensions, and a list of materials and supplies.

**WHITEPRINTS** are white with blue line drawings.

**BLUEPRINTS** use a blue background with white lines.

**FLOOR PLANS** show where built-in cabinetry, appliances, and utilities will be placed.

**ELEVATIONS** represent vertical views of built-in cabinetry.

**MATERIAL SPECIFICATIONS** list types of lumber, molding, paneling, hardware, and finishing materials to be used on the project.

**WORK SCHEDULE** tells cabinet maker when to install built-in cabinets.

**SHOP DRAWINGS** only show the product, not the surrounding furnishings, and they are submitted to contractor for approval prior to fabrication. These drawings usually include a 3-view drawing. The shop plan lists the separate operations and parts that will be used.

To **READ THE SHOW DRAWINGS** first note the information in the title block (which tells the project name, scale of drawing, drawing number, and revisions), then look at the views, check the list of materials, and then review the plan of procedure.

**A PICTORIAL VIEW** shows the final product.

**EXPLODED VIEWS** show the product disassembled.

**ASSEMBLY VIEWS** use dotted lines to show how to assemble the product.

**A PARTS BALLOON** is a circle that includes additional specific information for a separate list of parts for a specific part of the project.

**TWO VIEW DRAWINGS** are used for cylindrical objects and show the front and side/end view.

**THREE VIEW DRAWINGS** show the front, side, and top views. Visible lines represent lines that can be seen from that view; hidden lines are shown by dashed lines.

**DETAIL DRAWINGS** are separate drawings of individual components.

**SECTION DRAWINGS** show how a joint was constructed. Diagonal lines represent where the material was cut away to reveal the view.

**DEVELOPMENT DRAWINGS** show the layout of the product as if it were flattened.

**THE ALPHABET OF LINES** shows the purpose of each type of line and how it is drawn. It includes visible lines, hidden lines, center lines, extension lines, etc.

**TOLERANCE** refers to the range of variance that is allowed.

**SPECIFICATIONS** list materials needed to produce the product. The architectural drawing specs are general; shop drawings are precise and often contain the plan of procedure.

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**“Rules of Thumb” supplemental article**

“Safety is a state of mind,” Michael Dunbar states, showing that if we are aware of the dangers and are always thinking about how to work safely, we will reduce our chance of getting hurt. Even experienced workers need reminders. Remember that tools should only be used for their intended purpose, only use a tool you know how to handle properly, and always use it the way you were shown. Don’t hurry. Don’t do anything that makes you
nervous. Obey warnings. Wear eye protection. Protect hearing and lungs. Keep the shop clean. Prevent accidents, but be prepared for them. Store flammables appropriately.

Textbook Chapter:  12  Pages: 139-164

The chapter discusses a variety of types of wood and includes information on where the wood is found, how common/rare it is, what it is used for, and what its characteristics or properties are. The purpose of the chapter is to help readers identify appropriate wood to use for specific projects, so it includes information about the grain pattern, pores, color, weight, hardness, etc. of the wood. It contains a chart at the end of the chapter that provides a useful quick comparison of a variety of woods and their working properties, physical properties, and recommended finishes.

Textbook Chapter:  1  Pages: 13-21

This chapter introduces cabinetmaking and discusses function (purpose) and form (aesthetic beauty) of cabinets. It discusses design ideas, variables, and standards. It briefly mentions softwood and hardwood as well as other materials such as MDF, veneer, particleboard, plywood, etc. The phases of producing cabinetry are also introduced.

Textbook Chapter:  10  Pages: 107-116

(Note: I’ve included comments from the lecture with the chapter notes.)

The chapter commences with an introduction to the deciduous and coniferous trees and their different root systems.

FIBROUS ROOTS grow and spread outward and are characteristic of deciduous trees (trees with broad leaves that typically lose their leaves in fall).

A TAP ROOT is typical of coniferous trees (cone-bearing trees that stay green year round) and grows long and pretty much straight down.

GROWTH CHARACTERISTICS:
- BARK is the outer layer of dead wood that protects the tree from weather, insects, and disease.
- CAMBIUM is the layer, one-cell thick, at the outer edge of the living part of the tree trunk, just inside the bark.
- EARLY WOOD/SPRING WOOD is where cells develop quickly, are larger, lighter colored, and have thinner walls. This growth occurs when there is plenty of moisture.
- LATE WOOD/SUMMERWOOD is where the cells are smaller, darker, and have thicker walls; it occurs when cells continue to be added during summer when moisture is less available.
- ANNUAL RINGS are the light and dark colored rings formed by earlywood and latwood growth. A tree might produce up to 2 per year, but typically trees produce one each year.
- SAPWOOD is the healthy, living, outer area beneath the cambium. When new growth occurs, sapwood becomes inactive, turns dark and is called HEARTWOOD, which is a more stable substance, providing structure for the tree.
- PITH is the thin, round, spongy core at the center of the tree.

PLAIN SAWN shows the grain on the face of the wood after it’s been milled.
QUARTER SAWN shows the straight grain and is more stable on the cellular leve.
CROSS SECTIONAL FACE is seen when you cut across annual rings.
RADIAL FACE is seen when the tree is cut through the center, perpendicular to growth rings.
TANGENTIAL FACE is seen by slicing an edge off the section of trunk.
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<tr>
<th>SOFTWOOD CELL STRUCTURE</th>
<th>HARDWOOD CELL STRUCTURE</th>
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<td>TRACHEIDS are vertical cells with pointed ends which make up about 90% of the tree’s cells</td>
<td>FIBERS are the vertical cells of hardwood. They are not as long as tracheids and are more rounded on the ends.</td>
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<td>HORIZONTAL RAYS carry nutrients to outer portions of the tree.</td>
<td>WOOD RAYS are horizontal food/liquid passages.</td>
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<td>RESIN DUCTS are formed when a space between cells expands, and the space is filled with sticky resin.</td>
<td>PARENCHYMA CELLS are used for food storage.</td>
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<tr>
<td>PITS are passageways among tracheids and rays allowing solutions to be passed from one cell to another.</td>
<td>VESSELS serve as main passage for liquid.</td>
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<tr>
<td>LINGIN is the substance that holds cells together.</td>
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MC, or MOISTURE CONTENT, describes the amount of water in the wood cells. It is important to know what the moisture content should be for a particular type of wood in the area in which you live in order to prevent warping, cracking, etc. EQUILIBRIUM MOISTURE CONTENT is the average MC % of wood. When processing wood, the moisture level should be at the EMC. SHRINKAGE occurs when wood cells lose moisture and begin to shrivel. DENSITY refers to the weight per unit of volume. ELASTICITY is the wood’s ability to spring back after being dented or bent.

CHAPTER 10 QUESTIONS:
1. Diagram the structure of tap and fibrous root systems.

2. The outer part of the cambium, called the phloem, generates new cells for the bark.
3. The light and dark colored areas formed by the earlywood and latewood growth are the annual rings.
4. The leaves of a deciduous tree will drop (a) in the fall.
6. The layers are the phloem (inner bark), the xylem (inside layer of cambium), the bark, the sapwood, heartwood, earlywood layers, latewood layers, and pith. (See above for descriptions.)
7. The three terms that identify faces of wood are the cross sectional face, radial face, and tangential face.
8. Five physical characteristics of wood include color, weight, density, moisture content, and specific gravity.
9. Both oxidation of wood cells and springwood becoming inactive cause the wood to darken.
10. What is the difference between free water and bound water in a wood cell? Water in the cell cavity is free water; water in the cell walls is bound water.

11. What happens when the free water is removed from a piece of wood? The wood is at its fiber saturation point.

12. What happens when the bound water is removed? The cell walls begin to shrivel and harden; the wood shrinks and distorts.

13. Construction grade lumber is not adequate for cabinetmaking because of its high MC level.

14. The direction wood shrinks is (c) mostly in the tangential direction.

15. The four different samples of shrinkage: radial, longitudinal, tangential

16. Specific gravity is a measure of density.

17. Reaction wood is caused by compression and tension in the tree as it grows. It does cause problems in working wood.

18. What is the difference between open grain and closed grain wood species? Large, open cells or pores in some woods look like small pits in surfaced lumber; they are considered open grain. Woods with smaller pores are closed grain.

19. Two mechanical properties of wood are strength and elasticity.

20. What is the method of removing dents from wood? Place a wet cloth over the dent and gently rub with a warm iron; the moisture will enter the cells and expand them to their original position.

Supplemental Article “Cut and Dried”
The article reviews a lot of what is covered in chapter 10 of the book, but being written by a different person, I do get better feel for what it all means—the flatsawn and quartersawn lumber and the methods of drying wood and of measuring the moisture content of the wood and the tendency of flatsawn wood to cup. I finally think I get the whole concept now of what it means that wood shrinks to a greater degree tangentially than radially. The new ideas I got from the article are the following: that it’s a good idea to reverse direction of growth ring arcs when gluing together narrow boards to create a panel and that knots should not be on the edge of a piece and should be used as a design element where possible.

Supplemental Article “Why Wood Distorts”
The article mentions that wood is dimensionally unstable and that when we build cabinets, the wood should hold together but still be allowed to shrink and expand. It explains the process of how moisture from the air is soaked into the cells of wood or is given off in the wood’s attempt to achieve MC equilibrium. Of all the reading so far, this article has the best illustrations that help me to visualize cup, bow, spring, and twist—in particular, the difference between bow and spring.

Textbook Chapter: 11  Pages: 117-138

SECTIONAL FELLING is cutting large sections of forest at once.

SYSTEMATIC FELLING is when trees are singled out for harvesting.

PLAIN SAWING cuts are made tangent to annual rings. It is less costly and wasteful than other methods but leaves wood more likely to distort when it dries.

QUARTER SAWING is cutting logs into four sections and cutting each quarter into boards at an angle of 65-90 degrees to the annual rings.

AIR DRYING requires that boards are stacked for free air movement.

KILN DRYING uses large ovens or kilns to reduce the moisture content of the lumber. It is a more expensive but faster method for drying wood.
NATURAL DEFECTS include knots, pitch pockets, bark pockets, heartrot, peck, grub holes.

WARP is the curving of wood on face, edge, or length of board. Types of warp are bow, kink, cup, crook, twist.

Other forms of defects include splits, checks, shakes, honeycomb, blue stain, decay, and insect damage. Machining can also cause defects, including machine burn, raised train torn grain, wavy dressing, skip, and dog hole.

Wood is graded according to quality. When ordering lumber, you need to know what quality you want and how much.

Special lumber processes include surfacing performed before you buy it, the type of seasoning, preservatives, and milled pattern.

Millwork consists of specialty items processed from molding grade lumber. It includes moldings, legs, spindles, and finials, dowels, plugs, buttons, and manufactured wood carvings.

CHAPTER 11 QUESTIONS

1. Why is wood considered a renewable resource? Replenishing wood sources is required when wood is harvested.

2. Two methods of harvesting are sectional and systematic felling.

3. List the three methods of sawing logs. Give advantages and disadvantages of the boards produced by each. PLAIN SAWING cuts are made tangent to annual rings. It is less costly and wasteful than other methods but leaves wood more likely to distort when it dries. QUARTER SAWING is cutting logs into four sections and cutting each quarter into boards at an angle of 65-90 degrees to the annual rings. These boards are less likely to cup. RIFT SAWING is cutting logs into quarters, but the quarters as sawn at about a 45-degree angle to the rings. The wood is less likely to cup than plain sawing, and the straight grain pattern runs lengthwise and is very thin and decorative.

4. After lumber I sawed, it is dried to reduce the moisture content.

5. The moisture content of construction grade lumber is approximately 20%.


7. Three defects caused by mold and fungus are peck, blue stain, and decay.

8. Illustrate five types of warp:

9. List three wood defects caused by improper seasoning: warp, splits, checks.

10. Describe the lumber defects often incurred during surfacing. Machine burn is a darkening of the wood caused by heat. It occurs when dull tools are used. Raised grain is a variation in surface texture caused by machining wood of high moisture content. Torn grain occurs when wood fibers are torn from the board by the cutting edge of a tool. Wavy dressing results when boards are fed into the surfacer faster then the blades cut. A skip is a section of a board which is unsurfaced. A dog hole is a scar in the board caused by a metal hook that grips the lot while it is sawed.
11. Identify four hardwood factory grades for cabinet making lumber: FAS, Thrift, No. 2, and No. 3 Common.
12. An example of finished market grade lumber is
13. Two grading systems for softwoods are construction and remanufacture grades.
14. What is the difference between factory grade hardwood and factory grade softwood?
15. Remanufacture grade softwoods have a moisture content that ranges from 6%-12%.
16. Lumber grading systems are established by the National Hardwood Lumber Association and Western Wood Products Association.
17. Random Widths and Lengths lumber is sold by volume.
18. Determine the board feet in two pieces of ½” x 8” x 6’ of rough sawn kin-dried Willow which is FAS grade. Write an order for the wood.
\[ \text{Bd ft} = \frac{N \times T \times W \times L}{144} \]
\[ = \frac{2 \times 1 \times 8 \times 6}{12} \]
\[ = 8 \text{ bd ft FAS Willow} \]
19. Determine the board feet in three pieces of 1 1/32” thick x 9 ½” x 10’ kiln-dried White Pine, which is surfaced on two sides and A Select finish grade. Write an order for the wood.
\[ \text{Bd ft} = \frac{N \times T \times W \times L}{144} \]
\[ = \frac{3 \times 1 \times 9 \frac{1}{2} \times 10}{12} \]
\[ = 23 \frac{3}{4} \text{ bd ft} \]

Work Order:
23 ¾  bd ft 1” thick A Select White Pine
20. Explain the difference between spindles, finials, and dowels. Spindles are used for support and decoration on stair rails, cribs, etc. Finials are ornaments, usch as decorative knobs. Dowels are round stock used primarily to strengthen joints.

**Textbook Chapter:** 21   **Pages:** 305-321

When sawing with stationary power machines, select the safest appropriate saw for the cut, make sure the saw is available, and have instruction on proper use of the saw. Before cutting, set up the saw with the power off, be sure the blade is clean and sharp, measure accurately, have guards in place, support material and feed it properly. All stock must be sawed square. The saw will have a blade raising device and possibly a tilting device to tilt the blade on an angle.

The RIP FENCE guides material that is being riped (cut along the grain).

A MITER GAUGE controls cutting across the grain.

The SPLITTER keeps the saw kerf open as the cut is made.

ANTIKICKBACK PAWLS prevent material from being thrown. The pawls ride on top of the material after it passes the blade.

To set up the table saw, decide whether to use a rip fence of miter gauge, set the blade height, and square the blade.
There are two methods to cut a number of pieces to equal lengths: A STOP BLOCK may be clamped to or placed against the fence. A STOP ROD is attached to the miter gauge.

BEVELING is sawing with the blade tilted. The blade should be tilted away from the fence or miter gauge.

If the stock width is greater than the maximum blade height, you must make two passes. Cut just over half way with the first pass. Then turn the material over with the same face against the fence to make the second pass.

A RADIAL ARM SAW can saw stock to length. It can be used for crosscutting, beveling, ripping, and mitering.

The SCROLL SAW and BAND SAW can be used to make curved lines. The BAND SAW can rip, bevel, and resaw. The SCROLL SAW cuts small radius curves for intricate work and can also be used for beveling.

The appropriate blade for the task at hand should be used, and blades should be maintained in good condition.

**Supplemental Article “A Tablesaw Primer”**

The article describes how to use a tablesaw to rip and crosscut material safely and gives illustrations of the tablesaw and its parts. It also gave some suggestions for narrow ripcuts, such as using a notched sled to push the material through (as opposed to your hand).

**WEEKLY JOURNAL ENTRY: Your entry is a reflection of your learning experience in the classroom specific to that day. What goals did you set for yourself and accomplish? What were your successes and any setbacks that you encountered? How did you successfully problem-solve any setbacks and turn them into positive learning experiences? What goals are you setting for yourself for next class session’s learning experience? What were your accomplishments relative to your classroom project?**

**Week 1:**

I really like how you have set up your course—with a specific project and schedule. I hate the “open lab” mentality that some shop and technology teachers have for their classes because I don’t learn as much without specific direction. I read a study when I was working on my single-subject teaching credential about ten years ago that said that girls learn best by having a particular goal or task to accomplish and that that’s why they tend to not do as well in classes such as computers. The study demonstrated that teachers who gave their classes specific projects had a higher success rate among female students and no decreased success rate among male students.

As an English professor, I also really love the fact that you require writing and take the time to teach students how to take notes. We always hear talk of “writing across the curriculum,” but I haven’t met too many teachers who actually do it. So thank you—on behalf of the entire English department at BC.

**Week 2:**

I thoroughly enjoyed Tuesday’s lecture on chapters 10-11. It made all that information so much more relevant and interesting. It is so much fun taking a class that isn’t a degree requirement. When I was in college, I always wanted to take some fun classes, like ceramics and P.E., but I just never had the time because I had to work to pay for school. I sort of dreamed about some day in the future when I would be able to do
something like this. It’s great. I also really like the academic feel to the class. I’ve already learned more than I thought I would over the course of the entire semester.

I am a Cal Poly SLO alumnus as well. I got my B.A. there in 1996. (My M.A. came from CSUB.)

I live in one of those really cool old houses in the Oleander area. It’s not as glamorous as Westchester, but it is still really cool. It’s a 1920 arts and crafts bungalow, and we’ve done a lot of work to it, including a complete kitchen and bathroom remodel, refinishing the hardwood floors, etc. It’s small and simple, but it is gorgeous. I think to myself nearly every day, “Man, I love my house.” And you can’t walk a block without encountering sidewalks that are deformed from tree roots. It’s very, very cool. Since my husband worked as a finish carpenter/cabinet maker for 12 years before becoming a high school drafting instructor, he has the tools and expertise that enable us to do pretty-much anything we want with the house (although we do call plumbers and electricians at times!)

My husband emailed this to me today. I thought you might enjoy it: