

STRANDS AND STANDARDS

FURNITURE DESIGN AND MANUFACTURING



Course Description

The second instructional course in a sequence that prepares individuals to apply technical knowledge and skills to prepare and execute furniture design projects; assemble and finish furniture articles; repair furniture; and stresses the safe use a variety of hand and power tools and machinery. Recommended projects would be anything that would allow students to incorporate all joints and tools, e.g. a chest of drawers.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	40.10.00.00.130
Concurrent Enrollment Core Code	40.10.00.13.130
Prerequisite	Woodworking
Skill Certification Test Number	522
Test Weight	0.5
License Type	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Cabinetmaking/Millwork
Endorsement 2	N/A
Endorsement 3	N/A



FURNITURE DESIGN & MANUFACTURING

STRAND 1

Students will understand furniture design, manufacturing, and theory.

Standard 1

Understand basic elements of the furniture manufacturing industry.

- Identify career opportunities using career pathways in furniture and cabinetmaking/millwork manufacturing.
- Identify career opportunities in related millwork industries.
- Describe the integration of cabinetmaking into construction schedules.

Standard 2

Understand the design, planning, and estimation process.

- Identify elements and principles of design as they apply to woodworking and cabinetmaking/millwork manufacturing.
- Identify standard furniture dimensions relating to tables, seating, and shelving.
- Draw/sketch the necessary views of a selected project.
- Create a material list for the selected project and determine the project cost.
- Follow a procedure list for construction of a cabinet.
- Extract pertinent cabinet information and specifications from working drawings and specifications.

Standard 3

Understand and demonstrate basic math and measuring concepts.

- Add two- and three-digit numbers.
- Subtract two-, three-, and four-digit numbers.
- Solve two-digit divisor numbers.
- Multiply a two-digit factor.
- Add, subtract, multiply, and divide fractions and mixed numbers.
- Convert fractions to decimals.
- Reduce fractions.
- Add, subtract, multiply, and divide decimal numbers.
- Calculate percentages and basic ratios.
- Add and subtract linear measurement in feet and inches.
- Use a ruler or measuring tape to measure within a sixteenth ($1/16$) of an inch.
- Calculate board feet and square feet.
- Demonstrate the optimization of materials.

Performance Skill

Understand furniture design, manufacturing, and theory.

- Understand basic elements of the furniture manufacturing industry.
- Understand the design, planning, and estimation process.
- Understand and demonstrate basic math and measuring concepts.

STRAND 2

Students will understand and demonstrate the safe use of woodworking tools.

Standard 1

Understand and demonstrate the safe use of hand tools.

- Describe the purpose and demonstrate the proper use of the following measuring and layout tools:
 - Measuring tape
 - Caliper (digital or dial)
 - Scratch awl
 - Framing square
 - Combination square
 - Try square
 - Sliding T-bevel
- Describe the purpose and demonstrate the proper use of the following cutting and shaping tools:
 - Back saw
 - Block plane
 - Wood chisel
 - Wood file/rasp
 - Hand saw
 - Glue scraper
 - Putty knife
 - Jack plane
 - Card scraper
- Describe the purpose and demonstrate the proper use of the following striking tools:
 - Claw hammer
 - Nail set
 - Dead-blow hammer
- Describe the purpose and demonstrate the proper use of the following drill bits:
 - Twist
 - Spade
 - Countersink
 - Driver bits: Phillips, Square, Flat
 - Multi-spur bit

Standard 2

Understand and demonstrate the safe use of portable power tools.

- Describe the purpose and demonstrate the proper use of the following portable power tools:
 - Pneumatic/power nail gun
 - Power drills

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- Router
- Finish sander
- Belt sander
- Orbital sander
- Biscuit jointer
- Hand jig saw

Standard 3

Understand and demonstrate the safe use of power machines.

- Describe the purpose and demonstrate the proper use of the following sawing machines:
 - Table saw
 - Power miter saw
 - Band saw
- Describe the purpose and demonstrate the proper use of the following surfacing machines:
 - Surface planer
 - Jointer
- Describe the purpose and demonstrate the proper use of the following sanding machines:
 - Disc sander
 - Wide belt sander
 - Spindle sander
- Describe the purpose and demonstrate the proper use of the following shaping machines:
 - Router table
 - Shaper
 - CNC machine
 - Lathe
- Describe the purpose and demonstrate the proper use of the following drilling machines:
 - Drill press
 - Line boring machine
 - Mortising machine

Performance Skill

Understand and demonstrate the safe use of woodworking tools.

- Understand and demonstrate the safe use of hand tools.
- Understand and demonstrate the safe use of portable power tools.
- Understand and demonstrate the safe use of power machines.

STRAND 3

Students will understand the methods of processing materials.

Standard 1

Understand and demonstrate safe practices.

- Demonstrate the ability to work safely in a cabinet shop following general safety rules.
- Demonstrate how to handle, store, and dispose of materials according to SDS sheets.
- Pass a written safety test with a score of 100 percent.

Standard 2

Understand and demonstrate the use of fasteners and adhesives.

- Identify the various woodworking fasteners and the application of each.
 - Nails
 - Screws
 - Staples
 - Pins
 - Bolts
- Properly use an adhesive in the construction of a project.
 - Yellow glue
 - Polyurethane glue
 - Cyanoacrylate
 - Epoxy
- Identify the different types of clamps.
 - Bar
 - "C"
 - Spring
 - Handscrew
 - Band
- Understand the gage system (nails, staples, pins, etc.).

Standard 3

Understand wood products, characteristics, and procedures.

- Describe the parts of a tree and the significance that it has in cabinet construction.
 - Bark
 - Sap wood
 - Heart wood
 - Pith
 - Annual (growth) rings
 - Lignin

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- Describe and identify natural defects in wood.
 - Warp
 - Cracks
 - Bark inclusions
 - Knots
- Understand the methods of the seasoning and drying lumber.
 - Standard moisture content levels for kiln and air dried lumber.
 - The effects of moisture on materials (expansion and contraction).
- Distinguish between softwoods and hardwoods.
- Identify the difference between solid wood and manufactured materials and describe the use of each.
- Identify wood species and their specific characteristics.

Alder	Walnut	Pine
Cherry	Maple	Mahogany
Oak	Poplar	Red Cedar
- Identify common manufactured wood products.
 - Plywood
 - Particle board
 - MDF
 - Baltic birch
- Identify common grades of lumber and sheet goods.
 - FAS
 - Select
 - #1COM
 - Rustic

Performance Skill

Understand the methods of processing materials.

- Understand and demonstrate safe practices.
- Understand and demonstrate the use of fasteners and adhesives.
- Understand wood products, characteristics, and procedures.

STRAND 4

Students will understand milling and assembly.

Standard 1

Understand and demonstrate the use of joinery.

- Identify the basic woodworking joints.

Butt	Mortise and tenon	Dowel
Miter	Dovetail	Biscuit
Rabbet	Groove (plough)	Blind dado
Dado	Lap	
Spline	Pocket	

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- Construct the basic wood joints used in furniture construction.

Standard 2

Understand and demonstrate the use of furniture components and hardware.

- Identify the components of a face frame and cabinet box.

Stile	Veneer	Kicker
Rail	Base	Drawer runner/glide
Mullion	Shelf	Back
Side	Web frame	
- Identify the door options in furniture making:
 - Flush
 - Overlay
 - Lip
 - Tambour
- Identify the components of a drawer.
- Identify and properly install common furniture hardware such as:
 - Hinges - offset, overlay, European, butt
 - Drawer guides
 - Pulls and knobs
 - Shelf supports
- Assemble a project with the proper adhesive and fasteners.
- Construct a drawer.
- Install a lid or door and drawer.
- Identify basic construction methods.
 - Frame and panel
 - Casework construction
 - Post and rail

Standard 3

Understand and demonstrate sanding and finishing techniques.

- Understand and properly apply the basic rules of sanding.
- Select and correctly use each specified grit size.
- Properly prepare a surface for finishing.
- Properly apply stain, penetrating oil, and/or a clear finish.
- Properly apply a clear coat.

Standard 4

Understand order of operations.

- Identify the steps for squaring a board.
 - Joint an edge
 - Rip to width
 - Cut one end square
 - Cut to length

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Performance Skill

Understand milling and assembly.

- Understand and demonstrate the use of joinery.
- Understand and demonstrate the use of furniture components and hardware.
- Understand and demonstrate sanding and finishing techniques.
- Understand order of operations.

STRAND 5

Students will be able to perform automated manufacturing processes using CNC equipment.

Standard 1

Understand X, Y, Z axis.

Standard 2

Understand vector lines.

Standard 3

Define G-code.

Standard 4

Create a tool path and use a CNC machine to make a cut.

Standard 5

Define vector and raster.

Performance Skill

Perform automated manufacturing processes using CNC equipment.

- Understand X, Y, Z axis.
- Understand vector lines.
- Define G-code.
- Create a tool path and use a CNC machine to make a cut.
- Define vector and raster.

STRAND 6

Students will understand the importance of career readiness skills as it relates to the workplace and outlined in the SkillsUSA Framework – Level 2.

Standard 1

Understand and demonstrate reliability.

- Determine individual time management skills.
- Explore what's ethical in the workplace or school.
- Demonstrate awareness of government.
- Demonstrate awareness of professional organizations and trade unions.

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Standard 2

Understand and demonstrate responsiveness.

- Define the customer.
- Recognize benefits of doing a community service project.
- Demonstrate social etiquette.
- Identify customer expectations.

Standard 3

Understand resiliency.

- Discover self-motivation techniques and establish short-term goals.
- Select characters of a positive image.
- Identify a mentor.

Standard 4

Understand and demonstrate workplace habits.

- Participate in a shadowing activity.
- Explore workplace ethics: codes of conduct.
- Recognize safety issues.
- Perform a skill demonstration.
- Exercise your right to know.

Standard 5

Understand and develop initiative.

- Develop personal financial skills.
- Develop a business plan.
- Investigate entrepreneurship opportunities.

Standard 6

Understand and demonstrate continuous improvement.

- Conduct a worker interview.
- Demonstrate evaluation skills.
- Examine ethics and values in the workplace.
- Develop a working relationship with a mentor.
- Construct a job search network.

Skill Certificate Test Points by Strand

Test Name	Test #	Number of Test Points by Strand						Total Points	Total Questions
		1	2	3	4	5	6		
Furniture Design & Manufacturing	522	11	18	18	16	5	2	73	70