

Course Overview

This course is designed for students to review and advance skills learned in previous woodworking courses. Students will complete two major projects which incorporate the three basic types of furniture construction including leg and rail, case, and frame and panel construction. Advanced machine operations and wood joinery techniques will be stressed.

Scope and Sequence

Timeframe	Unit	Instructional Topics
4 Day(s)	Unit 1- Safety Review	1.1: Woodworking Lab Safety
3 Day(s)	Unit 2- Materials and Purchasing	2.1: Materials used in Cabinetmaking 2.2: Purchasing
3 Day(s)	Unit 3- Order of Operations	3.1: Matching Stock to Thickness 3.2: Matching Stock to Width 3.3: Matching Stock to Length
4 Day(s)	Unit 4- Advanced Wood Joinery	4.1: Wood Joints
6 Day(s)	Unit 5- Leg and Rail Construction	5.1: Spindle Turning on Wood Lathe 5.2: Rail Design and Construction 5.3: Top Design and Construction
4 Day(s)	Unit 6- Advanced Finishing Techniques	6.1: Penetrating Finishes 6.2: Non Penetrating Finishes
5 Day(s)	Unit 7- Frame and Panel Construction	7.1: Frame and Panel Router Bit Set
10 Day(s)	Unit 8- Case Construction	8.1: Layout and Design 8.2: Dados and Rabbets 8.3: Case Assembly
15 Day(s)	Unit 9- Engineering and Design	9.1: Pencil and Paper Technical Drawing 9.2: Solidworks 9.3: Mastercam 9.4: Corel Draw X3 9.5: Laser Engraver 9.6: CNC Router
2 Day(s)	Unit 10- Careers in Woodworking	10.1: Researching Careers in the Woodworking

		Trade
Ongoing	Unit 11- Literacy Integration	11.1: Writing 11.2: Presentation 11.3: Speaking/Listening

Academic Vocabulary

kerf
dado
rabbet
joint
CNC
board foot
plywood
veneer
rip
crosscut
face
edge
end
arris
corner

Prerequisites

Cost: Determined by individual project needs

Materials and Resources

- Pencil
- Notebook
- Folder
- Wood Glue
- Tape Measure
- Safety Glasses
- Lock for Locker
- Lumber and other Raw Materials
- Woodworking Tools and Equipment

Course Details

UNIT: Safety Review -- 4 Day(s)

Description

Students will utilize tools in the woodworking shop to create a useful project. Safety and proper use of tools and equipment will be stressed throughout the unit.

Academic Vocabulary

Board Foot
Kerf
Rip
Crosscut
Joint
Surface
Grain
Annular Rings
Aris
Corner
Side
End
Edge

Materials and Resources

Wood
Screws
Glue
Nails
Various determined by project

TOPIC: Materials Used in Cabinet Making [Ongoing]

Learning Targets

Review and demonstrate and safely use portable and stationary woodworking power tools.

Students will pass with 100% accuracy the power tool safety test and they will demonstrate the their use in a safe manner.

Review and demonstrate safe use of hand tools

Students will pass with 100% accuracy the safety rules for the woods lab and use the tools correctly.

Review and demonstrate the safe use of CNC equipment and Laser Engraver

Students will pass with 100% accuracy the safety test and will use them in a safe manner.

UNIT: Materials and Purchasing -- 3 Day(s)

Description

Students will learn about various species of woods and types of materials used in furniture and cabinet construction. Basic math including adding and subtracting fractions, decimals, and the calculation of board feet will be discussed.

Materials and Resources

- Pencils
- Paper
- Calculators

TOPIC: Materials Used in Cabinet Making [Ongoing]

Learning Targets

Explain where specific cabinet making materials would be used and sold.

- Standard plywood
- Veneer plywood
- Luan plywood
- Particle board
- Other sheet goods

Identify and select and use various adhesives to build a useful product

Students will learn about the characteristics of various types of adhesives used in the cabinetmaking industry.

Examples include the following:

- Regular yellow wood glue
- Gorilla glue
- Contact cement
- Water proof wood glue
- Hot glue
- Silicone

Identify and select and use various fasteners to build a useful product

Identify various types of fasteners and where they are used. Furthermore, they will be able to select the appropriate fastener when necessary. These fasteners will include:

1. Nails
2. Screws
3. Brads

Review and identify a minimum of ten wood species commonly used in furniture construction.

Students will be given various samples to identify on a test and explain their various characteristics and common uses.

They will include the following:

1. Oak
2. Butternut
3. Pine
4. Basswood
5. Maple
6. Walnut
7. Cherry
8. Mahogany
9. Poplar
10. Cedar

Review and identify natural and man-made cabinetmaking materials

- Standard plywood
- Veneer plywood
- Luan plywood
- Particle board
- Other sheet goods

TOPIC: Wood Joints [Ongoing]

Learning Targets

Estimate the materials needed to construct a given product.

Estimating is an essential element of the cabinetmaking trade. Students will accurately estimate the total cost of a given project and write an estimate reflecting their calculations.

Review and demonstrate the ability to calculate board feet

Calculating board feet allows a student to calculate the cost of lumber used. It also helps them to estimate the amount of lumber and therefore cost of the project.

UNIT: Order of Operations -- 3 Day(s)

Description

Students will learn the procedure for squaring up rough sawn lumber using the flat solid sequence.

TOPIC: Machining Stock to Thickness [Ongoing]

Learning Targets

Explain and demonstrate the procedure for machining a board to a workable length.

This includes selecting the appropriate machine to complete the task.

Explain and demonstrate the safe and correct operation of the jointer.

They will joint the better face and edge of the board and explain the way to check the machine for accuracy.

Explain and demonstrate the safe operation of the surfacer.

They will also explain how the surfacer works as well as the different knife configurations and their pros and cons.

TOPIC: Machining Stock to Width [Ongoing]

Learning Targets

Explain and demonstrate the set-up and operation procedures used for ripping on the table saw.

They must select the appropriate blade to complete the task.

TOPIC: Machining Stock to Length [Ongoing]

Learning Targets

Utilize the compound miter saw to cut stock to length.

Utilize the table saw to cut stock to length.

UNIT: Advanced Wood Joinery -- 4 Day(s)

Description

Review and demonstrate the construction of a variety of wood joints commonly used in furniture and cabinetmaking.

Academic Vocabulary

Rabbet
Dado
Kerf

Unit Level Key Questions

What factors contribute the durability of a wood product?
What factors contribute to the cost of a wood product?

Materials and Resources

- Woodworking machines
- Pencil
- Tape Measure

TOPIC: Top Design and Construction [Ongoing]

Learning Targets

Explain the positive and negative attributes of the joint and where it would be used.

Review and demonstrate the procedure for making a various joints.

- biscuit joint
- pocket hole joint
- dado joint
- rabbet joint
- dado/rabbet joint
- butt joint
- flat miter joint
- tongue and groove joint
- rabbet edge joint
- cross lap joint
- end lap joint
- dowel joint
- dovetail joint
- reverse glue joint

UNIT: Leg and Rail Construction -- 6 Day(s)

Description

Students will build a simple table using leg and rail construction from a set of plans.

Materials and Resources

- Woodworking machines
- Pencil
- Tape Measure
- Hand Tools

TOPIC: Spindle Turning on Wood Lathe [Ongoing]

Learning Targets

Demonstrate the procedure for using the lathe duplicator to duplicate a specific design.

Safety and operating procedures will be covered.

Explain and demonstrate the procedure for setting up a wood lathe for spindle turning.

They will use the wood lathe to shape a table leg for their project.

TOPIC: Rail Design and Construction [Ongoing]

Learning Targets

Identify and apply specific design elements that can add visual appeal.

Inlays, wood burning, and veneering techniques will be utilized to add visual appeal.

TOPIC: Top Design and Construction [Ongoing]

Learning Targets

Demonstrate and apply the procedure for selecting wood, preparing it for glue up, grain considerations, gluing, and dimensioning.

Explain the characteristics of wood and specific considerations that must be incorporated into their design to avoid problems.

UNIT: Advanced Finishing Techniques -- 4 Day(s)

Description

Students will review and learn how to apply various types of wood finishes. Commercial finishing techniques will be discussed.

Academic Vocabulary

Stain
Polyurethane
Penetrating Finish
Non-Penetrating Finish
Shellac
Friction Polish

Unit Level Key Questions

What factors should be considered when selecting a finishing method for a given project?

Materials and Resources

- Stain
- Polyurethane
- Brushes
- Spray Gun

TOPIC: Penetrating Finishes [Ongoing]

Description

Identify and describe the characteristics of a penetrating finish

Learning Targets

Utilize stain to change the color of wood.

They will apply stain and the safety considerations associated with the product. Oil and water based products will be discussed.

TOPIC: Non Penetrating Finishes [Ongoing]

Description

Identify and describe the characteristics of a non-penetrating finish

Learning Targets

Utilize urethanes and lacquers to finish their projects.

Students will differentiate between various types of non penetrating finishes that may be used to finish their projects.

Water and oil based products will be discussed. Students will have the opportunity to try a variety of finishes in order for them to learn their positive and negative attributes.

UNIT: Frame and Panel Construction -- 5 Day(s)

Description

Students will use raised panel router bit set to create a decorative mirror and raised panel doors.

Materials and Resources

- Raised panel router bit set
- Router table
- Other woodworking equip

TOPIC: Pencil and Paper Technical Drawing -- 2 Day(s)

Learning Targets

Calculate the dimensions used in frame and panel construction.

Students will learn how to calculate the dimensions used in frame and panel construction. Correct dimensions are essential to the structural integrity of the product.

Demonstrate procedure for setting up and using the frame and panel router bit set.

Students will learn the procedures for setting up and using the frame and panel router bit set.

UNIT: Case Construction -- 10 Day(s)

Description

Students will build a cabinet using case construction.

Materials and Resources

- 3/4" Plywood
- Dado Blades
- Kreg Jig
- Screws
- Glue
- Nail Guns
- Woodworking Machines

TOPIC: Layout and Design [Ongoing]

Learning Targets

Design a cabinet using case construction.

They will use veneer plywood for the main carcass of their project and learn how to use hardwoods to create a face

TOPIC: Dados and Rabbets -- 0 Day(s)

Learning Targets

Calculate the width and depth of the dado they need for their design.

Once the dimensions are determined they will learn the procedure for accurately setting up the dado blades in the table saw.

TOPIC: Case Assembly [Ongoing]

Learning Targets

Utilize wood glue, screws, nails, and staples to assemble their projects.

They will use hand tools and the nail gun to assemble their projects.

UNIT: Engineering and Design -- 15 Day(s)

Description

Students learn to use Solidworks, MasterCam, and Corel Draw X3 to create drawings and parts to be cut out on the CNC Routers and Laser Engraver.

Academic Vocabulary

1. X, Y, Z coordinates
2. Vector
3. G-Code
4. Post-Processor
5. CNC (Computer Numerical Control)
6. CAM (Computer Aided Manufacturing)

TOPIC: Pencil and Paper Technical Drawing -- 2 Day(s)

Description

Students create drawings and sketches using a variety of drafting tools.

Learning Targets

Demonstrate the use of various drafting tools.

Students will use a variety of hand drafting tools to create technical drawings.

Describe and utilize the appropriate line types and weights while drawing.

Drafters use different types and weights of lines in order to show detail on a drawing. Students learn to recognize various line types and use them to create technical drawings.

Draw the top, front, and side views of a three dimensional object

Students will learn to draw a three-dimensional object in two-dimensions by creating a three-view drawing. Three view drawings are used in a variety of different disciplines.

TOPIC: Solidworks -- 3 Day(s)

Description

Students will use Solidworks computer program to create both 2-D and 3-D technical drawings.

Learning Targets

Create a three dimensional drawing of a selected object using the program.

Students learn how to use Solidworks to create technical drawings in a three-dimensional environment.

Create a three view drawing using the program

Students will create two-dimensional technical drawings

Describe the function of various icons and demonstrate their use.

Students will be assigned specific drawings that will focus on certain features of the computer program. By completing the assigned drawing students will demonstrate the use of certain features.

TOPIC: Mastercam -- 3 Day(s)

Description

Mastercam is a program used for designing parts and programming a CNC machine. It is commonly found in industry.

Learning Targets

Create a contour toolpath

A contour toolpath is used to tell the machine to follow a line or series of lines.

Create a pocket toolpath

Pocketing toolpaths are used to remove material in a given location

Create an accurate drawing using the CAD functions of Mastercam

Students learn to create technical drawings using Mastercam. These drawings are then used to write CNC programs to run CNC machines.

Describe the vocabulary terms associated with CNC programming

CNC programming has a variety of technical terms associated with it. It is imperative that students understand the terms in order for them to understand how to use the machine.

Verify the toolpath and create the appropriate g-code to control a CNC router

Students learn to use computer simulation in order to make sure that they have created a usable program. Once the program is acceptable it is processed into CNC code.

TOPIC: Corel Draw X3 -- 1 Day(s)

Description

Corel draw allows students to create drawings and designs on a computer that can be laser engraved.

Learning Targets

Demonstrate how to import clip art and convert it to a usable image

Students learn to convert clipart to a bitmap and make the changes appropriate to laser engraving.

Demonstrate the use of the program to create a design

Students will learn basic commands and features that will allow them to create a design to be used on the laser engraver.

TOPIC: Laser Engraver -- 1 Day(s)

Description

Students learn the basic concepts of using a laser engraver

Learning Targets

Demonstrate the ability to properly set up the laser engraver and the print setup portion of Corel Draw.

Students learn how to properly set-up the laser for project specific applications. These applications include raster and vector cutting. We also discuss how to adjust the laser for cutting various materials such as wood, glass, leather, lexan, and various others.

Demonstrate the laser engraving process on a useful product

Students design a product to be laser engraved given specific criteria.

Describe the proper and safe use of the laser engraver

The laser engraver has a number of hazards associated with it if not used correctly. Students gain a working knowledge of these hazards and learn how to use the machine safely.

TOPIC: CNC Router -- 1 Day(s)

Description

Students will gain hands on experience learning basic cnc programming and processes

Learning Targets

Demonstrate the procedure for zeroing the axes of the CNC router

Demonstrate the proper way to open a CNC program.

Describe the proper use of the CNC router and the associated safety precautions

UNIT: Careers in Woodworking -- 2 Day(s)

Description

Students will explore various careers within the field of woodworking. A field trip to Fox Valley Technical College in the spring is required for all Design Woods Students.

Academic Vocabulary

carpenter
cnc programmer
engineer
woodworker

Unit Level Key Questions

What are some careers associated with the woodworking industry?

Materials and Resources

- Bus
- Safety glasses
- Other

TOPIC: Speaking/Listening [Ongoing]

Learning Targets

Conduct research and analyze a career in the woodworking industry.

Students will be given a checklist of expectations and topics to include.

Students will be assessed based upon their IDEAS.

Identify careers in the woodworking industry and describe the education pathways that lead to the career.

Students will tour Fox Valley Technical College and various woodworking and cabinet shops.

UNIT: Literacy Integration -- Ongoing

TOPIC: Writing [Ongoing]

Learning Targets

Locate and review an article/career of choice dealing with technology and engineering today.

TOPIC: Presentation [Ongoing]

Learning Targets

Conduct research, organize ideas and present using a multimedia format

TOPIC: Speaking/Listening [Ongoing]

Learning Targets

Actively participate in large and small group discussions.