Woods I

Little Chute
Technology and Engineering
Grades 10 - 12, .5 Credits

Course Overview

Woodworking 1 deals with the proper and safe use of woodworking tools and machinery. It also includes the application of consumer and industrial finishing materials on wood products. Each student will construct several projects to demonstrate and evaluate their abilities.

Scope and Sequence

Timeframe	Unit	Instructional Topics
5 Day(s)	Unit 1- Safety	1.1: Woodworking Lab Safety
5 Day(s)	Unit 2- Introduction to Materials and Purchasing	2.1: Materials used in Cabinetmaking 2.2: Purchasing
5 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
5 Day(s)	Unit 4- Faceplate and Spindle Turning	4.1: Turning material on a Wood Lathe
8 Day(s)	Unit 5- Introduction to Wood Joinery	5.1: Types of Wood Joints
5 Day(s)	Unit 6- Introduction to Wood Finishes	6.1: Penetrating Finishes 6.2: Non Penetrating Finishes
2 Day(s)	Unit 7- Careers in Woodworking	7.1: Researching Careers in the Woodworking Trades
10 Day(s)	Unit 8- Engineering and Design	8.1: Pencil and Paper Technical Drawing 8.2: Solidworks 8.3: Mastercam 8.4: Corel Draw X3 8.5: Laser Engraver 8.6: CNC Router
Ongoing	Unit 9- Literacy Integration	9.1: Writing 9.2: Presentation 9.3: Speaking/Listening

Academic Vocabulary

Board Foot
Plywood
Veneer
Dado
Rabbet
Kerf
Rip
Crosscut
Joint
Face
Edge
End
Aris
Corner
Penetrating Finish
Non-Penetrating Finish
Pocket Hole

Prerequisites

None
Cost: $40.00 for materials

Materials and Resources

Pencil Notebook
Folder
Wood Glue
Tape Measure
Safety Glasses
Lock
Lumber / Raw Materials
Woodworking tools and equipment

Course Details

UNIT: Safety -- 5 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: Woodworking Lab Safety [Ongoing]

Description
Students will be introduced various woodworking tools and machines. They will learn the correct and safe operation practices associated with each machine. Each student must pass a written knowledge test with 100% and demonstrate the safe operation of each tool to be used in the woodworking lab.

Learning Targets

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.

Demonstrate safe use of hand tools

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

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: Introduction to Materials and Purchasing -- 5 Day(s)

Description
Students will learn about various species of wood and types of materials used in the furniture and cabinetmaking industries. Basic math skills including adding and subtracting fractions, decimals, and the calculation of board feet will be discussed.

Academic Vocabulary
Oak
Maple
Walnut
Cherry
Ash
Basswood
Butternut
Plywood
Medium Density Fiberboard (MDF)
Particle Board
Oriented Strand Board (OSB)
Board Foot
Square Foot

Unit Level Key Questions
How are solid wood purchased and how is the price calculated?
How are sheet goods purchased and how is the price calculated?

Materials and Resources
Samples of various species of wood and types of sheet goods

TOPIC: Materials used in cabinet making [Ongoing]

Description
Students will differentiate between natural and man-made materials.

Learning Targets

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 but are not limited to the following:

Oak
Butternut
Pine
Basswood
Maple
Walnut
Cherry
Mahogany
Poplar
Cedar

Identify and select the most appropriate adhesive for a given task

Students will learn about various types of adhesives and compare and contrast their strengths and weaknesses. The

following types will be discussed:

yellow wood glue
gorilla glue
contact cement
waterproof glue
hot glue
silicone

Identify man-made cabinet making materials

Students will be given samples of man-made materials to identify. They may include the following:

standard plywood
veneer plywood
luan plywood
particle board
medium density fiberboard (MDF)

Identify various fasteners and select the most appropriate fastener for a given application.

Students will identify various fasteners and where they are used. They will compare and contrast the strengths and weaknesses each. Fasteners include the following

brads
screws (various types)
nails
pin nails

TOPIC: Purchasing [Ongoing]

Description

Students will compare and contrast the methods for purchasing dimensional lumber verses rough sawn lumber. They will also explain how sheet goods are purchased.

Learning Targets

Identify the appropriate materials and calculate its cost based on a specific unit of measure

Discuss different methods of purchasing materials and calculate costs based on square foot, board foot, and dimensional prices. Estimating will also be covered as it pertains to project planning and cost analysis.

UNIT: Order of Operations -- 5 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

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.
Demonstrate the safe operation of the surfacer.

The will also explain how the surfacer works as well as the different knife configurations and their pros and cons.
Identify and explain the procedure for machining a board to a workable length.

This includes selecting the appropriate machine to complete the task.

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

Learn to use the table saw to cut stock to length.

Utilize the compound miter saw to cut stock to length.

UNIT: Faceplate and Spindle Turning -- 5 Day(s)

Description
Students will use the wood lathe to construct a useful project.

Academic Vocabulary
faceplate
gouge
skew Chisel
parting Tool
head stock
tail stock

Materials and Resources
wood lathe
wood
glue
lathe tools
screws

TOPIC: Types of Wood Joints [Ongoing]

Learning Targets

Demonstrate the procedure for setting up a wood lathe for spindle turning

Demonstrate the procedure for setting up the wood lathe for faceplate turning

Students will set up and utilize a wood lathe to create a useful project using a faceplate attachment on the wood lathe

Demonstrate the procedure for setting up the wood lathe for turning on a mandrel

Students will set up and turn a part using a mandrel. Projects can include the following:

wood pen
wooden yo-yo
other

UNIT: Introduction to Wood Joinery -- 8 Day(s)

Description
Identify a variety of different 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: Non Penetrating Finishes [Ongoing]

Learning Targets

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

Identify 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: Introduction to Wood Finishes -- 5 Day(s)

Description
Students will learn how to apply various types of wood finishes.

Academic Vocabulary
Stain
Polyurethan
Penetrating Finish
Non-Penetrating Finish
Shellac
Friction Polish

Unit Level Key Questions
What factors shoud 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: Pencil and Paper Technical Drawing -- 2 Day(s)

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

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: 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
cabinetmaker
CNC programmer
engineer
machine operator
carpenter

Unit Level Key Questions
What are some career opportunities associated with the woodworking industry?

Materials and Resources
- Bus
- Safety glasses
- Other

TOPIC: Researching Careers in the Woodworking Trades [Ongoing]

Learning Targets

Complete a research paper about a career in the woodworking field.

Students will be given a checklist of expectations and topics to include.
Students will be assessed based upon their IDEAS.

UNIT: Engineering and Design -- 10 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 imperitive 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.

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

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 axies 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: 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.