

STRANDS AND STANDARDS

INTERMEDIATE WOODWORKING



Course Description

Intermediate woodworking is designed to build upon the skills learned in beginning woodworking. Through project construction and hands on learning, students will gain a deeper understanding of wood as a material and in planning and estimating. Value is placed on developing craftsmanship, a production sense, and design principles.

Intended Grade Level	10-12
Units of Credit	0.5 or 1.0
Core Code	38.02.00.00.262
Concurrent Enrollment Core Code	N/A
Prerequisite	Beginning Woodworking
Skill Certification Test Number	5202
Skill Certification Cut Score	N/A
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education
Required Endorsement(s)	
Endorsement 1	Woods

STRAND 1: Safety

Students will develop safe woodworking habits

Standard 1

Students will be aware of physical hazards present in a woodshop.

- Sharp objects and cutting hazards.
- Heavy objects and crushing hazards.
- Kickback and potentially airborne objects.
- Moving parts of machinery and applicable safety zones.
- Excessive noise present in a woodshop.

Standard 2

Students will be aware of chemical hazards present in a woodshop.

- Common chemicals found in a woodshop (glue, finish, etc.).
- Students will be aware of the dangers of sawdust.
- Students will know what a Safety Data Sheet (SDS) is and where to find it.

Standard 3

Students will understand the importance of cleaning and organization in a woodshop and how that relates to safety.

Standard 4

Students will know what Personal Protective Equipment (PPE) is and when it should be used.

Standard 5

Students will be aware of clothing hazards present in a woodshop.

- Loose or dangling items or pieces (including hair, draw strings, baggy clothing, etc.)
- Open toed shoes
- Jewelry

Performance Skill

- Students will complete a basic safety test without errors (100%) before using any tools or equipment. Consult with your school division's risk management department for specific policies or procedures.
- Students will keep woodshops and classrooms clean and organized while working, after completing work, and when storing materials and projects.
- Students will always wear safety glasses inside the woodshop.

Follow this link for more safety guidance:

[General Safety Guide for Career and Technical Education \(utah.gov\)](https://utah.gov)

STRAND 2: Woodworking Education & Careers

Students will explore careers in woodworking and manufacturing.

Standard 1

Students will understand how this course fits into the USBE Manufacturing Pathway.

Standard 2

Students will learn about woodworking jobs and careers in their local area and across Utah, including how many jobs are available, how much they pay, and what education and training they require.

Standard 3

Students will learn about jobs and careers in different fields that use similar skills as the woodworking industry, such as job prospects, wages, and required education.

Standard 4

Learn about higher education opportunities in Utah for woodworking.

Standard 5

Learn about licensing requirements tied to the woodworking and manufacturing industry

STRAND 3: Properties and Characteristics of Wood

Students will learn the properties of solid wood and engineered wood products and their applications in building cabinets and furniture.

Standard 1

Learn about the following engineered wood products:

- Plywood
 - Alternating layered veneers
- MDF (Medium Density Fiberboard)
 - Wood fibers and resin pressed into sheets
- Particle board
 - Wood chips and resin pressed into sheets
- Melamine
 - Engineered wood core with plastic-like face

Standard 2

Learn the advantages and disadvantages of using engineered wood.

Advantages	Disadvantages
Dimensionally Stable High strength across length and width Minimal or no milling required Can be purchased pre-finished	Susceptible to moisture Limited thicknesses and sizes available Harder to repair dents, scratches, and chips Appearance of edges

Standard 3

Understand the grading system for plywood.

- Hardwood Plywood
 - Face veneer graded A-D with A being the highest quality
 - Back veneer graded 1-4 with 1 being the highest quality

Standard 4

Differentiate between hardwood and softwood

Standard 5

Identify the following domestic hardwoods:

- Maple
- Cherry
- Walnut
- Alder

Standard 6

Identify the following domestic softwoods:

- Cedar
- Pine

Performance Skill

- Students can identify the following:
 - Plywood
 - MDF
 - Particle Board
 - Melamine
- Students can appropriately use engineered wood as part of the course project
- Students can identify the following:
 - Maple
 - Cherry
 - Walnut
 - Alder
 - Cedar
 - Pine

STRAND 4: Using CAD & CAM Software

Students will become familiar with computer-aided design (CAD) and computer-aided manufacturing (CAM) software.

Standard 1

Students will understand how to use computer-aided design (CAD) software to create the following:

- Basic 2D geometry
- Simple 3D geometry such as:
 - Cubes
 - Rectangular Prisms
 - Cylinders
- Simple joinery

Here are some CAD software packages that have web-based versions that will work on a Chromebook:

- Sketchup
- Fusion 360
- OnShape

Standard 2

Students will understand computer-aided manufacturing (CAM) software.

- Setup virtual workpiece
- Draw basic geometry and text
- Import simple images and graphics
- Create toolpaths using appropriate bit
- Understand chip load and its importance in cutting efficiency

$$\text{Chip load} = \frac{\text{Feed Rate (IPM)}}{\text{RPM} \times \text{number of flutes}}$$

- Understand cutter profiles
 - End mill
 - V-bit
 - Ball Nose
- Identify different types of toolpaths
 - Engraving/V-carve
 - Pocket
 - Profile

Performance Skill

- Students can create a simple 3D model using CAD software (ie. Small drawer, bookshelf, etc.)
 - This modelling does not have to be related to the projects
- Using CAM software and a CNC router, students can create and cut the following toolpaths:
 - Engraving/V-carve
 - Pocket
 - Profile

STRAND 5: Planning and Estimating

Students will learn how to estimate the cost of a project made of wood.

Standard 1

Students will understand common measurements used in lumber stores, when to use each one, and how to calculate them.

- Board Footage for solid wood

$$BF = \frac{\text{Thickness}(in) \times \text{Width}(in) \times \text{Length}(in)}{144}$$

OR

$$BF = \frac{\text{Thickness}(in) \times \text{Width}(in) \times \text{Length}(ft)}{12}$$

- Linear Feet for moldings and sticks

$$1' = 12''$$

- Square Footage for sheets goods

$$SF = \text{Length}' \times \text{Width}'$$

Standard 2

Students will know the common dimensions of wooden materials found in lumber stores.

- Solid Wood (lengths and widths vary)
 - 4/4 approx. 1"
 - 6/4 approx. 1 1/2"
 - 8/4 approx. 2"
- Sheet goods
 - 4'x8'
 - Thicknesses of 1/4", 1/2", and 3/4"

Standard 3

Students will learn how to create a materials list and cut list from a scale drawing.

- Measurements are written in the same format
 - Thickness x Width x Length
- Plan for non-wood materials
 - Hardware
 - Finish
 - Fasteners
 - Consumables
 - Sandpaper
 - Adhesives

Standard 4

Students will learn how to optimize materials and minimize waste.

- Add extra material for unavoidable waste
- Design/plan projects to work well with common lumber dimensions

Standard 5

Learn to estimate the cost of a project from a materials list.

Performance Skill

- Students can accurately measure within 1/16" of an inch.
- Students can create a readable materials list and cut list.
- Students can accurately calculate the cost of a project when given a materials list.

STRAND 6: Joinery and Hardware

Students will learn how to cut advanced joinery and install hardware

Standard 1

Students will learn to identify the following joints and one or more ways to cut them:

- Mortise and Tenon
- Miter Joint
- Reinforced Joints (ie. Dowel, spline, biscuit, nails, screws, etc.)
- Lap joints
- Box Joint
- Dovetail Joint
- Blind Joints

Standard 2

Students will identify the following hinges and their applications:

- Butt hinge
- European Hinge

Standard 3

Students will identify the following drawer slides and their applications:

- Side mount
 - Roller Slides
 - Ball Bearing Slides
- Undermount

Standard 4

Students will identify knobs and pulls and their applications

Performance Skill

- Students can cut advanced joinery
- Students can install hardware