Wood Manufacturing III: Turning the Tables

Course Information

Grade(s):	10-12
Discipline/Course:	Technology Education
Course Title:	Wood Manufacturing III: Turning the Tables
Prerequisite(s):	Wood Manufacturing I: Introduction to Woodworking (Must have received at least an A grade), or Wood Manufacturing II: Making the Case for a Bedside Cabinet
Course Description: Program of Studies	This intermediate level course is designed to introduce students to the processes and techniques of leg and rail construction in furniture. Student skills and knowledge will be developed through tool and machine use. Techniques in lathe work, joinery and inlaying will also be offered. Upon completion of required projects, the student will continue on advanced project work.
Course Essential Questions:	● What are the economic aspects of woodworking as a potential career path and what opportunities and challenges lie ahead? ● How can woodworking instructors and students create a culture of safety in the high school woodworking classroom? ● What are the most important factors to consider when creating a safe woodworking environment? ● What is the concept of "form follows function" in woodworking design and how will it influence your project decisions? ● What are the ethical implications of using rare or exotic woods in woodworking projects? ● How do you add beauty and individuality to your woodworking designs? ● What are some of the factors to consider when choosing ~~the right~~ joinery for a particular woodworking project? ● What advantages are gained using machines to do work? ● Why is proper machine set-up so important? ● How do you choose the right tool or machine for specific tasks and how can you analyze the advantages and disadvantages of each type? ● How do you turn raw materials into usable products in woodworking?

	● How can lathe work be used to create unique and beautiful woodworking elements? ● How do you choose the right clamp, cauls, glues or mechanical fasteners for your project? ● How does following a plan lead to success in a product's manufacture? ● How do the different processes and techniques of leg and rail construction affect the strength, durability, and aesthetic appeal of a woodworking project? ● What are the factors that affect the strength of a woodworking joint, and how can these factors be manipulated to create stronger joints? ● How can the principles of physics and engineering be applied to the design and use of clamps, cauls, glues, and mechanical fasteners for table assembly? ● What are the trade-offs between durability, appearance, and ease of application when choosing a finish for a particular woodworking project? ● What is the role of finish in furniture? ● What is the purpose of a knob or handle? ● What are the trade-offs between using traditional and modern hardware in furniture design? ● How has the use of hardware evolved in furniture design? ● Why is it important to verify that completed work matches expectations? ● How do I troubleshoot problems that arise during a woodworking project?
Course Enduring Understandings:	● Woodworking is a process of transformation that involves taking raw materials, such as logs and lumber, and transforming them into finished products, such as furniture, cabinets, and toys. ● Woodworking is a craft that takes time and practice to master. ● Woodworking can be a way to reduce waste and promote sustainability. ● It is important to be able to identify and safely use the resources, processes, concepts, and tools related to woodworking technology. ● The skills and knowledge gained through woodworking can be transferred to other contexts and disciplines, such as engineering, design, and mathematics. ● A woodworking plan or working drawing is a blueprint that provides instructions for how to construct a project. ● Design choices for a given project depends on a number of factors, including the type of wood, the desired strength, and the aesthetic considerations. ● Tabletop styles can be used to create tables that are both functional and beautiful.

	● Woodworking is a practical field that requires students to apply their knowledge and skills to solve real-world problems. ● It is important to be trained on how to use woodworking equipment safely and efficiently. ● There are a variety of woodworking cutting techniques, each with its own advantages and disadvantages. ● The ability to read and interpret drawings and plans is a valuable skill for anyone to have, regardless of their chosen career path. ● Leg and rail construction is a basic woodworking technique that can be used to create a wide variety of furniture and structures. ● There are a variety of ways to construct drawers, each with its own advantages and disadvantages. ● The woodworking process requires students to be flexible and adaptable, as problems can arise unexpectedly. ● Mortise and tenon joints are a strong and versatile way to join the legs and rails of a table together. ● Woodworkers must be able to identify and analyze problems, and develop and implement solutions. ● The sanding method used will depend on the type of wood and the desired finish. ● Staining can be used to create a variety of different looks, from natural and rustic to modern and sophisticated. ● When laying out hardware, students must consider factors such as functionality, aesthetics, and safety. ● Attention to detail is important. Even small details, such as the placement of a knob or handle, can make a big difference in the overall appearance of a project. ● Woodworking can also help students to develop a sense of pride and accomplishment. ● Precision is essential in woodworking. Small errors in layout can lead to big problems with the final product. ● Assessment and evaluation can be used to improve future woodworking projects. By identifying what went well and what could be improved, students can make better decisions on future projects.

Duration/Credit:	Full Year/ 1.0 credit(s)
Course Materials/ Resources:	Machinery and consumables
FPS Course Academic Expectation(s):	CC Creating and Constructing: CI Conveying Ideas:
Year at a Glance (Units)	Unit 1 - Course Introduction and General Safety (1 week) Unit 2 - Project Design (1-2 Weeks) Unit 3 - Machine Use (4 weeks) Unit 4 - Project Construction (20 weeks) Unit 5 – Joinery and Assembly (4 weeks) Unit 6 - Finishing (2 weeks) Unit 7 – Hardware (2 weeks) Unit 8 - Project Review and Evaluation (1 week)

Unit Number and Title:	Unit 1 - Course Introduction and General Safety
Duration:	1 week
Resource(s):	Equipment and consumables
Unit Overview:	Students will review safety practices and policies. This will include the safety practices for specific machinery and include the procedures related to workplace and job-site safety, personal protective equipment, machine safety, and material handling practices.
Learning Goals	
Standard(s):	**CT Standards Wood Technology 2014** WM.02 Describe and demonstrate the procedures related to workplace and job-site safety including personal protective equipment, machine safety, and material handling practices. WM.02.01 Demonstrate safe material handling practices. WM.02.02 Demonstrate and explain knowledge of workplace safety procedures.*(A2) WM.02.03 Demonstrate and explain knowledge of personal safety practices pertaining to eye wear, footwear, clothing, and personal protective equipment (PPE) used in wood technology.*(A3) WM.02.04 Describe safety practices for specific machines. WM.02.05 Demonstrate knowledge of proper use, storage, and disposal of hazardous materials following OSHA's proper safety practices for a woodworking facility.*(A1)
Essential Question(s):	● What are the economic aspects of woodworking as a potential career path and what opportunities and challenges lie ahead? ● How can woodworking instructors and students create a culture of safety in the high school woodworking classroom? ● What are the most important factors to consider when creating a safe woodworking environment?
Enduring	● Woodworking is a process of transformation that involves taking raw materials, such as logs

Understanding(s):	and lumber, and transforming them into finished products, such as furniture, cabinets, and toys. ● Woodworking is a craft that takes time and practice to master. ● Woodworking can be a way to reduce waste and promote sustainability. ● It is important to be able to identify and safely use the resources, processes, concepts, and tools related to woodworking technology. ● It is important to be trained on how to use woodworking equipment safely and efficiently.
Learning Goal(s): Students will be able to use their learning to: (Content/ Skills)	**Content:** (Students will know…) ● OSHA and its role in a woodworking facility. ● the procedure to safely dispose of flammable rags and oily finishes. ● the rules and routines for operating in professional and respectful manner in a manufacturing environment. **Skills:** (Students will be able to…) ● describe the dangers and ramifications of unsafe behavior. ● develop a personal respect for machines, equipment and colleagues in the shop area. ● identify and describe various types of personal protective equipment. ● read and discuss information on OSHA, EPA and other safety regulations. ● describe safe material handling practices.

Unit Number and Title:	Unit 2 - Project Design
Duration:	1-2 Weeks
Resource(s):	Equipment and Consumables
Unit Overview:	Students will create a 1/4-scale and isometric drawings of their project including all the necessary joinery. From that they will create a stock-list that will guide them while they mill and machine their project pieces.
Learning Goals	
Standard(s):	**Standards Wood Technology** WM.04 Explain and be able to demonstrate the methods involved in turning raw materials into useable products. WM.04.01 Describe and interpret technical drawings. WM.04.02 Describe and prepare rough drawings and sketches. WM.04.03 Explain and prepare a cut list or bill of material from a basic plan and assembly drawing. WM.04.04 Interpret a design to facilitate replication. WM.04.05 Describe and identify fractional measurements from a basic plan and assembly drawings. WM.04.07 Extrapolate information from a set of plans. WM.04.08 Measure accurately to a sixteenth of an inch. WM.04.09 Estimate materials quantities in both board feet and linear feet. WM.04.10 Interpret a design to facilitate replication.
Essential Question(s):	● What is the concept of "form follows function" in woodworking design and how will it influence your project decisions? ● What are the ethical implications of using rare or exotic woods in woodworking projects? ● How do you add beauty and individuality to your woodworking designs? ● What are some of the factors to consider when choosing the right joinery for a particular woodworking project?

Enduring Understanding(s):	● The skills and knowledge gained through woodworking can be transferred to other contexts and disciplines, such as engineering, design, and mathematics. ● A woodworking plan or working drawing is a blueprint that provides instructions for how to construct a project. ● Design choices for a given project depends on a number of factors, including the type of wood, the desired strength, and the aesthetic considerations. ● Tabletop styles can be used to create tables that are both functional and beautiful.
Learning Goal(s): *Students will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● the identity and use of the following measuring, layout, and marking tools: steel rule, tape measure, combination square, sliding "T" bevel, and compass. ● the difference between technical drawings and rough drawings or sketches. ● the meaning of "scale" and how it applies to technical drawings. ● how to describe and identify fractional measurements from a basic plan and assembly drawings. ● the difference between both nominal and actual dimensions. ● how to draw and visually communicate simple geometric shapes and parts. ● the difference between board feet and linear feet. **Skills:** (Students will be able to…) ● demonstrate an understanding of rough drawings and sketches. ● explain and use fractional dimensions. ● identify, use and maintain measuring, layout, and marking tools. ● measure accurately to a sixteenth of an inch. ● create a 1/4-scale drawing of their table.

Unit Number and Title:	Unit 3 – Machine Use
Duration:	4 weeks
Resource(s):	Equipment and consumables
Unit Overview:	Students will continue expanding their knowledge of new tools and new techniques utilizing tools they have already learned how to use in new ways, such as table saws and routers.
Learning Goals	
Standard(s):	**Standards Wood Technology** WM.03 Identify and describe the safe and appropriate use of various types of hand and power tools and machinery used for building. WM.03.06 Identify proper use and function of the following hand tools: cross cut saw, rip saw, level, coping saw, nail set, hand plane, chisel, and file.*(B11) WM.03.08 Identify the proper use and function specialty machinery (e.g. drill presses. jointers. surface planers. table saws. power miter saws. band saws. scroll saws. and stationary sanders.* WM.03.09 Identify proper use and function of the table and miter saws.*(B12) WM.03.10 Explain and demonstrate correct use of planers. WM.03.11 Explain and demonstrate use of molders WM.03.12 Identify functions and demonstrate use of wood lathes. WM.03.13 Identify and demonstrate use and function of sanders. WM.03.14 Select appropriate tools, procedures, and/or equipment
Essential Question(s):	● What advantages are gained using machines to do work? ● Why is proper machine set-up so important? ● How do you choose the right tool or machine for specific tasks and how can you analyze the advantages and disadvantages of each type? ● How do you turn raw materials into usable products in woodworking?
Enduring	● Woodworking is a practical field that requires students to apply their knowledge and skills to

Understanding(s):	solve real-world problems. ● It is important to be trained on how to use woodworking equipment safely and efficiently. ● There are a variety of woodworking cutting techniques, each with its own advantages and disadvantages.
Learning Goal(s): Students will be able to use their learning to: (Content/ Skills)	**Content:** (Students will know…) ● the safety guidelines for the tools and machinery in the woodshop. ● the methods for turning raw materials to useful products within the woodshop. ● the woodworking machines and tools names and their basic functions. ● the "Milling Process," its steps, and the safety and operation of the machinery utilized in "milling" a board. ● the definitions of flat, square, and coplanar. ● the differences between rough and finished dimensions. **Skills:** (Students will be able to…) ● safely cut a miter. ● safely cut small pieces on the chop saw. ● sharpen hand tools. ● identify and describe the safe and appropriate use of various types of hand and power tools and machinery used for building. ● demonstrate the methods involved in turning raw materials into useful products. ● accurately mill a board to rough and finished dimensions. ● drill holes. ● shape edges with a hand and/or table router. ● sand with a disc, belt or spindle sander. ● cut angles with a miter saw. ● use a mortiser and/or horizontal boring machine. ● utilize Lathe to turn projects.

Unit Number and Title:	Unit 4 – Project Construction
Duration:	20 weeks
Resource(s):	Equipment and Consumables
Unit Overview:	Students will explore leg and rail construction and use this knowledge to construct and produce parts of a table. They will learn how to properly make and utilize several basic wood joints in construction of their table. In the process they will continue to learn and practice setting-up and adjusting a variety of wood manufacturing power equipment.
Learning Goals	
Standard(s):	**Standards Wood Technology** WM.03.02 Identify proper use and function of the following portable power tools: circular saw, drill, jig/saber saw, finishing sanders, and routers.*(B9) WM.03.03 Identify proper use and function of the following fastening tools: hammer, Phillip head screwdriver, and slotted/flat head screwdriver.*(B10) WM.03.04 Demonstrate and explain knowledge of proper use and storage of portable power tools.*(A6) WM.03.05 Demonstrate and explain knowledge of proper use and storage of basic hand tools.*(A5) WM.03.06 Identify proper use and function of the following hand tools: cross cut saw, rip saw, level, coping saw, nail set, hand plane, chisel, and file.*(B11) WM.03.07 Identify proper use and function of stationary saws. WM.03.08 Identify the proper use and function specialty machinery (e.g. drill presses. jointers. surface planers. table saws. power miter saws. band saws. scroll saws. and stationary sanders.* WM.03.09 Identify proper use and function of the table and miter saws.*(B12) WM.03.10 Explain and demonstrate correct use of planers. WM.04 Explain and be able to demonstrate the methods involved in turning raw materials into useable products. WM.04.11 Consider the natural characteristics of grain, knots, and checks when laying out a board.*(C19)

	WM.04.13 Identify and select the proper cutting process based on grain direction.*(E23) WM.04.14 Identify how grain direction affects a material's strength.*(E24) WM.04.15 Understanding kerf and its application to cutting and layout operations.*(E25)
Essential Question(s):	● How can lathe work be used to create unique and beautiful woodworking elements? ● How do you choose the right clamp, cauls, glues or mechanical fasteners for your project?
Enduring Understanding(s):	● Woodworking can help students develop the ability to persevere in the face of challenges and to learn from their mistakes. ● The ability to read and interpret drawings and plans is a valuable skill for anyone to have, regardless of their chosen career path. ● Leg and rail construction is a basic woodworking technique that can be used to create a wide variety of furniture and structures. ● There are a variety of ways to construct drawers, each with its own advantages and disadvantages.
Learning Goal(s): Students will be able to use their learning to: (Content/ Skills)	**Content:** (Students will know…) ● the process for laminating boards for different designs. ● the use of a handscrew to laminate leg stock correctly. ● the steps to creating a tapered or cabriole leg. ● the construction methods for different type of drawers and runner styles. ● the definition of a "leg and rail" joint. ● mortise and tenon joinery and its variations. **Skills:** (Students will be able to…) ● extrapolate information from a set of plans to describe and interpret technical drawings. ● construct and produce parts of a "Leg and Rail" style table. ● properly make and utilize several basic wood joints in construction of a project. ● set-up and adjust a variety of woodworking machines. ● laminate boards by gluing and clamping. ● identify different styles of table legs. ● construct legs by laminating squared up pieces of wood.

	● square up a leg blank. ● taper cut a leg or turn a leg on the lathe using the standard tools and techniques ● build an overlay, lipped or flush drawer. ● construct at least one type of drawer mount. ● recognize at least three tabletop styles and construct one.

Unit Number and Title:	Unit 5 – Joinery and Assembly
Duration:	4 weeks
Resource(s):	Equipment and Consumables
Unit Overview:	The students will be learning how to utilize various clamps, cauls, glues and mechanical fasteners in the assembly of their table.
Learning Goals	
Standard(s):	**Standards Wood Technology** WM.03.03 Identify proper use and function of the following fastening tools: hammer, Phillip head screwdriver, and slotted/flat head screwdriver.*(B10) WM.04.11 Consider the natural characteristics of grain, knots, and checks when laying out a board.*(C19) WM.04.12 Identify and assemble the following types of joints: butt, miter, dado, rabbet, and lap.*(G27) WM.04.14 Identify how grain direction affects a material's strength.*(E24) WM.04.19 Identify and describe the purpose and use of the following woodworking fasteners: common nails, round head screws, flat head screws, and oval head screws.*(H29) WM.04.20 Identify, describe purpose of and use woodworking adhesives.* WM.04.21 Identify and describe the purpose of the following clamping devices: bar clamp, c-clamp, parallel/hand screw clamp, and spring clamps.*(H30)
Essential Question(s):	● How does following a plan lead to success in a product's manufacture? ● How do the different processes and techniques of leg and rail construction affect the strength, durability, and aesthetic appeal of a woodworking project? ● What are the factors that affect the strength of a woodworking joint, and how can these factors be manipulated to create stronger joints? ● How can the principles of physics and engineering be applied to the design and use of clamps, cauls, glues, and mechanical fasteners for table assembly?

Enduring Understanding(s):	● The woodworking process requires students to be flexible and adaptable, as problems can arise unexpectedly. ● Mortise and tenon joints are a strong and versatile way to join the legs and rails of a table together.
Learning Goal(s): Students will be able to use their learning to: (Content/ Skills)	**Content:** (Students will know…) ● the use of different types of clamps to address the project's assembly and glue up. ● the techniques to correctly attach table tops to the skirts of their project. ● the steps to correctly edge prep boards and prepare a top for glue up. ● the various ways to match face grain on a table top. ● decorative techniques for project's surfaces. ● the steps for creating a table top from multiple boards. **Skills:** (Students will be able to…) ● assemble a mortise and tenon joint. ● construct and assemble a table. ● attach table legs to skirts. ● construct and assemble an overlay drawer. ● construct a table top. ● square-up a base and attach a table top to the base.

Unit Number and Title:	Unit 6 – Finishing
Duration:	2 weeks
Resource(s):	Equipment and Consumables
Unit Overview:	Students will learn how to properly sand and prepare their projects for finish. They will also learn about various types of finishes and their characteristics that make them better in certain circumstances. They will use this knowledge to choose and apply the finish on their table.
Learning Goals	
Standard(s):	**Standards Wood Technology** WM.03.13 Identify and demonstrate use and function of sanders. WM.03.16 Demonstrate good housekeeping at a workstation within the total laboratory. WM.03.17 Identify color coding safety standards. WM.03.18 Explain fire prevention and safety precautions and practices for extinguishing fires. WM.03.19 Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment WM.04.22 Identify and apply various wood finishes for interior and exterior, with brush or wipe on, for the following: paint, stain, and clear coat.*(I31) WM.04.23 Describe the abrasive grit numbering grading system.*(F26) WM.04.24 Differentiate among various abrasive materials. WM.05 Describe and demonstrate the attributes of wood design.
Essential Question(s):	● What are the trade-offs between durability, appearance, and ease of application when choosing a finish for a particular woodworking project? ● What is the role of finish in furniture?
Enduring Understanding(s):	● The sanding method used will depend on the type of wood and the desired finish. ● Staining can be used to create a variety of different looks, from natural and rustic to modern and sophisticated.

Learning Goal(s): Students will be able to use their learning to: (Content/ Skills)	**Content:** (Students will know…) ● the benefits of different finishes, such as, top coats, hard waxes, and penetrating finishes. ● the method of creating their own wood putty from sawdust and glue. ● the uses of epoxy as design elements. ● the method for correctly mixing epoxy. ● the uses of cyanoacrylate adhesive to repair cracks and checks. ● pigments and dyes and how they are used in epoxy. ● the differences between color dyes and oil based stains. **Skills:** (Students will be able to…) ● apply a protective finish to their wood project. ● understand the difference between stains, primer coats and top coats. ● utilize the correct solvent when cleaning brushes. ● sand their project to a “finished” smoothness utilizing correct abrasive papers.

Unit Number and Title:	Unit 7 – Hardware
Duration:	2 weeks
Resource(s):	Equipment and Consumables
Unit Overview:	Students will learn how to utilize layout techniques to place hardware for maximum functionality.
Learning Goals	
Standard(s):	**Standards Wood Technology** WM.10 Identify types, finishes, and mechanisms of hardware WM.10.02, WM.10.04 WM.11 Fabricate Furniture WM.11.11
Essential Question(s):	● What is the purpose of a knob or handle? ● What are the trade-offs between using traditional and modern hardware in furniture design? ● How has the use of hardware evolved in furniture design?
Enduring Understanding(s):	● When laying out hardware, students must consider factors such as functionality, aesthetics, and safety. ● Attention to detail is important. Even small details, such as the placement of a knob or handle, can make a big difference in the overall appearance of a project.
Learning Goal(s): Students will be able to use their learning to: (Content/ Skills)	**Content:** (Students will know…) ● the role of a drawer pull, knob, handle, or recessed hole play in the overall aesthetic of the project. ● the different drawer runner constructions and their pros and cons. ● the layout for the two points for a two point handle on a drawer front. ● why and when a pilot hole and countersink might be necessary. ***Skills:*** (Students will be able to…) ● lay out the location of knobs and/or handles. ● drill the proper holes to accommodate screws.

	● mount knobs and handles to the drawer fronts. ● set a drawer square and level. ● apply pulls to cabinet doors and drawers. ● apply drawer slides to projects. ● apply latches and catches to projects.

Unit Number and Title:	Unit 8 - Project Review and Evaluation
Duration:	1week
Resource(s):	Equipment and Consumables
Unit Overview:	Students will reflect on the process of designing, building and finishing their table, evaluating the entire process in addition to the end product.
Learning Goals	
Standard(s):	**Standards Wood Technology** WM.04 Explain and be able to demonstrate the methods involved in turning raw materials into useable products. WM.04.01 Describe and interpret technical drawings. WM.04.02 Describe and prepare rough drawings and sketches.*(C14) WM.04.03 Explain and prepare a cut list or bill of material from a basic plan and assembly drawing.(C15) WM.05 Describe and demonstrate the attributes of wood design. WM.05.01 Utilize the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results. WM.05.02 Check and critique a design continually, and improve and revise the idea of the design as needed. WM.05.03 Design and create cabinet and wood products WM.05.04 Develop a production plan, including the layout, bill of materials, and cost analysis, for the production of cabinets or wood products.
Essential Question(s):	● Why is it important to verify that completed work matches expectations? ● How do I troubleshoot problems that arise during a woodworking project?

Enduring Understanding(s):	● Woodworking can also help students to develop a sense of pride and accomplishment. ● Precision is essential in woodworking. Small errors in layout can lead to big problems with the final product. ● Assessment and evaluation can be used to improve future woodworking projects. By identifying what went well and what could be improved, students can make better decisions on future projects.
Learning Goal(s): Students will be able to use their learning to: (Content/ Skills)	**Content:** (Students will know…) ● the elements that make a project successful. ● the elements make a project aesthetically pleasing. ● the procedure for assessing errors and mistakes of a finished project. **Skills:** (Students will be able to…) ● self-evaluate woodworking projects. ● identify quality aspects of completed work. ● identify changes which could improve the process.