Black Horse Pike Regional School District
580 Erial Road, Blackwood, NJ 08012

Advanced Woodworking

COURSE OF STUDY

Technology Education Department

Written By:

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Date:

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Supervisor:

Steve Arena

Approved by:
Marcie Geyer, Director of Curriculum & Instruction

ADVANCED WOODWORKING

TRITON REGIONAL HIGH SCHOOL

Course Syllabus

Mr. O'Donnell

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Phone #

REMIND CODE

CLASS CODE

COMMON TIME AVAILABILITY

LETTER DAYS

COURSE DESCRIPTION

10-12 Graders

5 Credits

This second level woodworking course will build on the first woodworking courses fundamentals as students build more and more complicated projects. Students will be exposed to plan reading, plan development, measurement, sketching, safety and the design process while constructing these projects. Students will have the opportunity to use power tools such as the drill press, sanders, band saw, planer, jointer, power miter saw, and table saw in a safe manner as they continue to further develop their woodworking skills throughout the year. Students will build historically, environmentally, and socially significant projects. Completion of this program will provide students with entry level skills and knowledge needed in today's construction industry. Teamwork, craftsmanship, and good work ethic will be emphasized throughout the year. Safety glasses must be worn at all times.

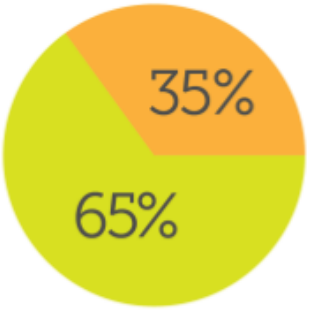
UNITS COVERED

- Wood Science and Hand Tools
- Machine Safety
- Advanced Joinery Techniques
- Project Planning and Ownership
  - Shelves and Racks
- Structural Joinery
  - Shaker Style Mortise and Tenon Table or Stool
- Advanced Project Development
  - Research, plan, prepare, and develop a custom woodworking project from rough lumber to a final, finished product

MATERIALS NEEDED

- Pencil (bring everyday)
- Safety Glasses

GRADING



CLASSWORK (65%): Anything you make or produce falls under this category including written assignments, quizzes, sketches and brainstorming activities, any computer-based work, and anything you build from your prototypes to your final designs.

PARTICIPATION (35%): You are expected to actively participate each and every day. Over a third of your grade is participation! Below are some pointers to help you succeed in class and earn full participation points every week:

LATE WORK

- Late work is -10% each day (not each class, but each day) it is late, up to -50% (5 days late). Work can still be turned in after that, but will be -50%.
- Up to teacher discretion.

ATTENDANCE

- If you are absent, it is your responsibility to e-mail me and check Google Classroom.
- If you know you're going to be out, notify me ahead of time so I can help you
- You will get extensions on assignments equal to the number of days you were out (out sick 2 days = 2 day extension)
- You must arrive to class BEFORE the bell rings to be marked present. If you arrive after the bell, you are late to class.

TOP 10 WAYS TO EARN FULL PARTICIPATION POINTS

1. Keep phone and headphones away while I am teaching
2. Keep quiet and pay attention during lectures, lessons and demonstrations
3. Ask questions if you're not sure what to do. If I am busy with someone else, try and look up the answer on your own or ask a classmate or partner (try to figure it out)
4. Each class we will have daily/weekly checkpoints. Make sure you know what they are and work to meet those checkpoints
5. When prompted to get to work, you should get to work within just a couple minutes. Any longer and you will lose participation points
6. Be productive and try your best. You should be working on your projects for this class for the majority of the period. Breaks are ok, but should be short and limited
7. Use school appropriate language and be mindful of your classmates
8. Arrive to class on time, prepared with all necessary materials and sit in your seat
9. Use tools, machinery, and classroom equipment correctly and safely
10. Have fun!

DESIGN & TECHNOLOGY DEPARTMENT

PERFORMANCE CHART

	ADVANCED	PROFICIENT	BELOW AVERAGE
GRADING GUIDE	A	B-C	D-F
EFFORT AND USE OF CLASS TIME **(Group or Individual)**	Extra effort during and after class time is put into project. Student(s) modeled exceptional behavior, were always on task, followed all safety rules, and helped others.	Consistent effort is put into the project during class time. Student(s) modeled good behavior, but was not always on task and misused equipment.	Inconsistent effort during class time. Student(s) did not use class time wisely, misused tools and machinery, and, as a result, missed checkpoints, deadlines and due dates.
ACCURACY AND NEATNESS	Project is prepared neatly and carefully. All measurements are accurate. Project is aesthetically pleasing and well built.	Project is fairly neat. Measuring is mostly accurate. Project is good. There is room for improvement.	Project is prepared with little care and lacks neatness. Project looks rushed and doesn't work as intended. Lots of room for improvement.
CREATIVITY	Project is original and imaginative. Design is unique, innovative and well thought out.	Project has some original elements. Design is somewhat clever but not entirely unique.	Project lacks creativity and thought. Design is not original and is more or less a copy of an existing one.
FOLLOWING INSTRUCTIONS, SPECIFICATIONS AND CONSTRAINTS	All project instructions have been followed. Every requirement has been met and exceeded.	Some project instructions and requirements met, but not all.	The majority of project instructions and requirements were not followed, have not been met, and project is incomplete.
DEMONSTRATES UNDERSTANDING	Student is extremely knowledgeable of project concepts and is able to help others.	Student displays knowledge of most concepts, methods and/or practices involved in the project.	Student lacks knowledge about project concepts, methods and practices.

Advanced Woodworking

School Calendar

1. Wood Science and Hand Tools
2. Machine Safety
3. Advanced Joinery Techniques
4. Project Planning and Ownership
5. Structural Joinery
6. CNC Machining
7. Advanced Project Development

September '22

Su	M	Tu	W	Th	F	S
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October '22

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November '22

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December '22

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January '23

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February '23

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March '23

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April '23

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May '23

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June '23

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Unit Summaries

Advanced Woodworking

Course Content

1. **Wood Science and Hand Tool Woodworking -** Students will learn about the origin, types, characteristics, and internal structure of wood. Students will practice with the tools to master the handsaws, planes, rasps/files, chisels, mallets, and try squares while working a piece of wood into a simple shaped project.

2. **Machine Safety** - Students will learn the universal machine safety rules. Students will learn the safety of the milling machines; including the jointer, table saw, power miter saw, planer, bandsaw, router table, hand router, sanders, scroll saw, and drill press. Students will learn the specific safety rules and operating procedures. Students will follow a basic set of plans while fabricating the butcher block. Students will learn to glue up flat panels, square up the board with the milling machines, fabricate the final shape, sand and finish the butcher block style cutting board.

3. **Advanced Joinery and the Woodworking Process -** Students will follow the woodworking process to learn to make a project with more multiple parts which uses more advanced joinery. Students will master machine skills and expand their knowledge of machines to cut joints with joinery systems within the shop.

4. **Project Planning and Ownership -** Students will work in groups to choose a project from the list. The students will work together to plan, mill, fabricate, assemble, and finish the projects.

5. **Structural Joinery -** Students will follow the woodworking process to build a mortise and tenon table. Students will accurately fabricate square parts, complete layout and assemble with structurally appropriate joinery. Students will finish this table to a high degree of refinement. (Activity: Shaker style Mortise and Tenon Table or stool)

6. **CNC Machining** - Students will be introduced to the CNC machines and by the end of this unit, students will create a VCarve file, safely set up their stock on the CNC Machine, successfully process their design, and clean up and shut down the machine for future use. Students will build a project utilizing one of the CNC machines. A plaque/sign project may be created or joinery, templates, or parts of a project may all be fabricated using the CNC machines.

7. **Advanced Project Development -** Students will choose, plan and execute a significant meaningful project. This project may have historical, technological, environmental, personal, cultural, multidisciplinary, or societal significance and may positively impact the lives of others. Students will research, plan, and develop their project. Students will write a specific order of operations and bill of materials describing the woodworking process in a detailed plan. Students will then mill, fabricate, assemble, finish and present the project to the class.

Programs: Autodesk AutoCAD, Onshape, V-Carve, Shaper

Course Expectations and Skills

1. Come to class each day willing to participate, prepared to learn, and ready to succeed.
2. Phones and other electronic devices should be kept away the entire time.
3. Use your resources when you are stuck (class notes or handouts, posts on Google Classroom, ask a classmate, search for the solution online, etc.)
4. When prompted to get to work, do not wait. Get to work right away!
5. Engineering is a process. Project will often take weeks or months to complete. Understand that you might not have the answers today, but if you keep at it and persist through, you will succeed.
6. Strive for accuracy and focus on craftsmanship.
7. See each project through to the end. Incomplete work will not be accepted.
8. Share ideas, help build, and equally contribute to group-based projects.
9. Practice proper attitude and safe discipline at all times.
10. Ask questions and have fun!

Resources:

Wagner, W. H., & Kicklighter, C. E. (2006). “Modern Woodworking (11th Ed.). Goodheart-Willcox Co.

Unit 1:	Wood Science and Hand Tools

Unit Summary
Students will learn about the origin, types, characteristics, and internal structure of wood. Students will practice with the tools to master the handsaws, planes, rasps/files, chisels, mallets, and try squares while working a piece of wood into a simple shaped project.

Essential Questions	**Enduring Understandings**
• Where does wood come from and how is it harvested and process • How does the tree's growth structure affect its woodworking properties?	• Wood comes from coniferous and deciduous trees that are in forests that are logged, harvested, dried,and milled into boards • Woods grain direction flows up and down the tree. Wood reacts very differently when cut along verses across this grain pattern for use.
• What wood working operations are you currently performing to the tree/wood?	• We process the wood using tools in a particular order of operations to make a desired product
• What fields of study and career opportunities are involved in the harvesting and processing of the raw material?	• . There are many rewarding careers in forestry, dendrochronology, and lumber processing
• What are the 4 Primary woodworking tools and what are they used for?	• The saw, plane, file and chisel can be used together to process wood into simple and complex shapes
• What order of operations must be followed to attain a square board?	• A board should be planed, jointed, ripped, then crosscut on its ends to attain a square board.
• How can safety be maintained while using sharp tools?	• One must consider many variables to maintain safe work operation including the person, wood, tool, workshop setting and careful, mindful focus always be maintained.

Behavioral Objectives/Learning Outcomes	**Standards (NJSLS)**
• Identify and compare softwoods and hardwoods and their sources in nature. • Identify defects in wood ○ Warps, knots, checks, metal • Recognize the interconnectivity and relationship between oneself to nature. • Identify and explore career paths in forestry related fields.	9.3.12.AG-NR.2 9.3.12.AG-PL.2
• Students will learn skills to utilize hand tools to process a board	9.3.MN.6

square, tools include: ○ Japanese ryoba saw, western crosscut saw, ○ block plane and bench plane ○ Rasp and file ○ Chisel and sharpening stone ○ try square.	
• Students will learn the order of operations to square a board ○ Try square use, face planing, edge planing, rip cutting, edge planing to a line, cross cutting, cross filing and draw filing.	9.3.12.AC-CST.9
• Students will demonstrate safe working practices while working in the shop and using tools.	9.3.MN.6

Interdisciplinary Connections
Science - Dendrochronology, environmental studies and sustainability, physics in cutting edge geometry English - Identify, compare and contrast, explain

21st Century Skills
Communication skills, problem solving, perseverance, collaboration, information literacy, global awareness, self-direction, social skills, literacy skills, social responsibility, thinking skills

Writing Assignments
“Tree to Shop” Worksheet Order of Operations Charcuterie Board Reflection Slide

Activities, Instructional Strategies, and Assignments
Batoning Boards and Branches Activity Chisels - Safe two handed paring and chopping Japanese saws - Crosscut and Ripcuts Coping saw - Cutting simple curves Planes - Edge planing, face planing, chamfering Files and Rasps-Shaping and End Grain filing Use a Try Square with hand tools to “Square a Board” Chisel and plane blade sharpening Charcuterie Board Project

Accommodations and Modifications (BHPRSD Accommodations and Modifications)
• Provide a variety of concrete examples from familiar contexts • Build background knowledge of content and vocabulary from familiar contexts prior to readings

- Provide oral & written instructions
- Incorporate multimedia/audio visual representation (YouTube, Discovery Education, TV Show parodies, etc.) to build understanding
- Use graphic organizers to guide notes, brainstorming, pre-writing, project planning, and test preparation
- Model through processes during assignments and elicit student-generated thoughts to determine gaps in understanding
- Highlight, bold, or underline main ideas in readings and in directions for writing assignments in the curricular areas
- Provide guiding questions to complete during the activity
- Provide chunking of instructional notes and activities to allow for formative assessment (checks for understanding) before moving on to the next stage
- Choose cooperative learning groups to ensure effective work, maximize productivity and support socialization
- Use multiple intelligences or the student's learning style to facilitate effective learning when a student is having difficulty grasping concepts
- Provide demonstrations, utilize pictures, or graphic to assist visual learners to support written text information
- Include oral discussions, oral presentations, group collaboration, or other oral delivery methods to support auditory learners
- Utilize hands-on activities, movement or rhythmic experiences to engage tactile/kinesthetic learners
- Provide chunking of assignments into manageable steps, including checklists that clarify directions for assignments
- Provide a clear, concise version of a scoring rubric prior to the assignment or assessment
- Highlight distinctive features/key concepts
- Provide choice of projects depending on the student’s interests or strengths
- Provide peer assistance/study groups
- Review, repeat, and clarify directions
- Chunk sections of assessment
- Allow for partial credit, when appropriate
- Allow use of familiar contexts to demonstrate understanding of key concepts when use of text evidence is not necessary
- Provide general assistance with organizational skills
- Utilize homework assignment notebook/planner/agenda
- Provide written intermediate timelines for long assignments
- Have student monitor grade average
- Keep rules simple and clear
- Implement a behavior management system

Formative Assessments

- Checkpoints on student Order of Operations
- Tree to Shop Worksheet

Summative Assessments

- Charcuterie boards

Performance Assessments
● Preparing for Class ● Batoning wood safely ● Sawing Wood safely ● Plane and Chiseling ● Sharpening a chisel or plane ● Project progress check points

RETURN TO CALENDAR

RETURN TO UNIT SUMMARIES

Unit 2:	Machine Safety

Unit Summary
Students will learn the universal machine safety rules. Students will learn the safety of the milling machines; including the jointer, table saw, power miter saw, planer, bandsaw, router table, hand router, sanders, scroll saw, and drill press. Students will learn the specific safety rules and operating procedures. Students will follow a basic set of plans while fabricating the butcher block. Students will learn to glue up flat panels, square up the board with the milling machines, fabricate the final shape, sand and finish the butcher block style cutting board.

Essential Questions	**Enduring Understandings**
• What are the General Shop Safety Rules you must always follow? • Why do you need to always wear safety glasses? • Why is it important to keep the classroom and the machines clean? • What if a machine is not cutting/drilling or it is making a strange noise?	• Shop maturity, attitude, and focus.are the foundation of safety in a shop. A few important rules are to have proper clothing, proper PPE, instructor is present, only using tools you have been cleared to use for specific operations. • A well organized and clean shop produces a safer environment. • Report all incidents and safety relevant information to the instructor immediately before proceeding to work.
• How do you safely operate the band saw? • How do you adjust the guards on the bandsaw? • How do you safely operate the power sander?	• The bandsaw must be set up with guards ¼ inch above the stock while it is not running. • Curved and straight cuts are made slowly, keeping fingers clear of the blade and its path, not forcing the turn or speed of the saw. Push sticks may be used to keep fingers clear on small cuts.
• When would you use a band saw vs. a power sander?	• Bands saw is used first to cut on the waste of the line by about an ⅛ of an inch, then the power sander can be used to sand up to the line and smooth out the saw marks.
• What are the steps you take when squaring up a board? • How do you use a square?	• There is a specific process used to attain a square board. We must machine all the surfaces in a specific order which utilizes reference surfaces. We must plane, joint, rip and then crosscut the board. • The try square is used to check surfaces for flatness and angles for squares.
• How do you safely operate the jointer? • How do most injuries occur on the jointer?	• Jointer takes small shavings with the grain from the bottom edge of the board that must be 10” in length. One slides the piece of wood on edge from the infeed to the outfeed table while keeping fingers 4” clear of the blade. • Main Safety Considerations - Clothing, finger placement, length and grain orientation, take multiple thin passes, correct feed direction and speed.

• How do you safely operate the planer? • When using the planer, how much material should you take off with each pass?	• Wood is fed flat, with the grain, into the rollers and cutterhead on the infeed table. Wood is kept stable while clothing and hands are kept clear of the planer. Do not stand in the kickback zone. • Only take passes up to 1/16 of an inch in depth. Do not plane smaller than ¼ inch,thick and 1 foot long stock.
• How do you safely operate the table saw? • What is kickback? • What is the difference between the fence and the miter gauge?	• Stock is rip cut, crosscut and joints milled with a table saw and accessory. Hands kept 4 inches from the blade. • While ripping the wood must stay tight to the fence to prevent wood kickback, • Use a fence to rip cut or a miter gauge to crosscut
• How do you safely operate the power miter saw? • How do you prevent your piece of wood from kicking?	• A conventional cut is made front to back of the saw. Saws are brought to full speed and a slow steady crosscut is made.The wood must be 12 inches long and properly fit in the saw being used. Fingers are kept 4-8 inches away from the blade. • To prevent kickbacks: No rip cuts, and no small pieces. Securely hold the wood flat and joint edge tight to the fence with adequate pressure. A clamp may be occasionally needed to keep a board stable.
• What tasks can the router perform to wood? • What safety concerns exist with routers? • Which direction does the bit spin and why is this important? • What operational procedures reduce risk with routers?	• Routers are highly versatile machines. Common uses include chamfering and rounding over the edge corners of wood. Routers are also used to cut joinery including dados, rabbets, mortises, tenons, box joints and dovetails. Routers can also mount into router tables and cnc machines. • Routers can throw wood and drag fingers into the wood, routers can “run” down the wood unexpectedly. Routers can shoot out sharp wood chips Clothing and jewelry must be tight and kept away from the router while learning over the router. • The bit spins clockwise while hand routing and counterclockwise in the router table. • Take multiple light depth cuts instead of one heavy one. We want to move the router with a conventional cut (against the spin) (Left to Right) to keep control. The climb cut (with the spin) (right to left) will cause a router to run when in hand. Keep it in a safe place on wood and not in contact with wood when starting and stopping the router.

Behavioral Objectives/Learning Outcomes	**Standards (NJSLS)**
• Identify critical parts of each power machine • Recall the safety rules of each power saw • Perform safe procedures congruent with each machines rules	9.3.MN-HSE.1

• Lay out and plan cuts and operations before approaching machine	9.3.MN.6
• Plan the steps of the project with a rough plan and sketch • Write an Order of operations for the fabrication of the butcher block • Crosscut boards to the length of the butcher block • Rip cut the boards into 1”strips • Assemble the strips into a chosen pattern with clamps and glue • Plane the Board flat and parallel on both faces • Rip cut to width • Crosscut ends to the length of the final butcher block • Layout the handle hole and bore the hole with the drill press • Layout and bandsaw the outer shape • Use the power sanders and smooth the outer shape • Route the edges to a chamfer or roundover • Sand the butcher block smooth throughout the sanding process grits • Apply an edible finish such as mineral oil or PURE tung oil • Reflect on the woodworking process	9.3.MN-HSE.1 9.3.MN.6 9.3.MN-QA.1

Interdisciplinary Connections

STEAM, English, Geometry

21st Century Skills

Critical thinking, communication skills, creativity, problem solving, perseverance, collaboration, information literacy, technology skills and digital literacy, self-direction, social skills, literacy skills, innovations skills, thinking skills

Writing Assignments

Students are encouraged to take written notes when taught safety on each machine. Safety Study Guides will be provided for each machine, but students should be filling out any missing information. Students will be taking written Safety Quizzes and must pass with a certain grade. Students who do not pass must review the content with the teacher and retake the safety quizzes before continuing work in the woodworking classroom.

Activities, Instructional Strategies, and Assignments

This unit is one of the most important because the content students learn here will carry through the rest of this course. This is where students will learn how to safely operate some of the machines in the woodworking classroom. In this unit, students will take a deep dive into all the standard power woodworking machinery.

1. The teacher will demonstrate how to safely use each machine.
    a. Students are required to identify and describe the most important parts of each machine.
    b. Students must know how to turn the machine on and off, adjust guards before making a cut, successfully make a cut, lower guards, and clean the machine for the next student.
2. After each demonstration, students will be given study guides that will have various parts labeled and a written checklist for how to safely operate each machine. Safety videos of the teacher’s demonstration and additional support materials will be posted to Google Classroom.

3. Students will take Safety Quizzes on each machine and must pass with a certain grade. Students who do not pass must review the content with the teacher and retake the safety quizzes before continuing work in the woodworking classroom.
4. Once students pass the written safety quiz for a machine, they are cleared to use that machine. Students will be assessed on their ability to safely use these machines.

After learning the safety on these machines, students will make a butcher block style cutting board. These projects are designed to ease students into Woodworking, get them using the tools and machines, getting familiar with how they work, feel, and sound. The goal is to build student confidence and make sure that students are using these machines safely and that they are comfortable. An emphasis is placed on accuracy of cuts, but as the year progresses, projects get more complex, and students use these machines more and more, the quality of their work should improve drastically.

Accommodations and Modifications (BHPRSD Accommodations and Modifications)

- Provide study guides and support outside of class time to review before assessments (common time or after school)
- Build background knowledge of content and vocabulary from familiar contexts prior to readings
- Provide oral & written instructions
- Incorporate multimedia/audio visual representation (YouTube, Discovery Education, TV Show parodies, etc.) to build understanding
- Use graphic organizers to guide notes, brainstorming, pre-writing, project planning, and test preparation
- Model through processes during assignments and elicit student-generated thoughts to determine gaps in understanding
- Highlight, bold, or underline main ideas in readings and in directions for writing assignments in the curricular areas
- Provide guiding questions to complete during the activity
- Provide chunking of instructional notes and activities to allow for formative assessment (checks for understanding) before moving on to the next stage
- Choose cooperative learning groups to ensure effective work, maximize productivity and support socialization
- Provide demonstrations, utilize pictures, or graphic to assist visual learners to support written text information
- Include oral discussions, oral presentations, group collaboration, or other oral delivery methods to support auditory learners
- Utilize hands-on activities, movement or rhythmic experiences to engage tactile/kinesthetic learners
- Provide chunking of assignments into manageable steps, including checklists that clarify directions for assignments
- Provide a clear, concise version of a scoring rubric prior to the assignment or assessment
- Highlight distinctive features/key concepts
- Provide choice of projects depending on the student's interests or strengths
- Provide peer assistance/study groups
- Review, repeat, and clarify directions
- Chunk sections of assessment
- Provide general assistance with organizational skills
- Provide written intermediate timelines for long assignments
- Have student monitor grade average
- Keep rules simple and clear

Formative Assessments
● Band Saw written safety quiz and hands-on quiz ● Power Sander written safety quiz and hands-on quiz ● Drill Press safety written Quiz and hands-on quiz ● Power miter saw written safety quiz and hands on quiz ● Planer written safety quiz amd hands on quiz ● Jointer written safety quiz and hands on quiz ● Table saw written safety quiz and hands on quiz ● Router written quiz and hands on quiz

Summative Assessments
● Hands-on work process and safety: ○ Butcher Block Cutting board Project

Performance Assessments
● Safely utilize all tools and machines

RETURN TO CALENDAR

RETURN TO UNIT SUMMARIES

Unit 3:	Advanced Joinery in the Woodworking Process

Unit Summary
Students will continue to expand their knowledge, operation and safety of the various machines, ultimately taking a project from an idea to a final, finished project. Students will be introduced to more complex joinery techniques, and will refine their skills with all of the milling and joinery machines, including new operations on the machines.

Essential Questions	**Enduring Understandings**
• What are the steps in the woodworking process? • How do we add joinery into the planning process?	• Planning, milling, fabricating, assembly and finishing are the general steps of the wood working process. • We study auxiliary drawings of joints and then write the cuts into the “order of operations” during the fabrication stage of the project. .
• During the fabrication process, What machines and tools are commonly utilized to cut joinery?	• Routers, tables saws, dado blades, power miter saws, drill presses, fine backsaws, planes, and chisels are commonly utilized in cutting joinery.
• What advanced operations can the machines perform?	• Miters, dados, rabbets, dovetails, spline cuts, chamfers and more can be performed by the standard machines with specific machine set ups and jigs and fixtures.
• Can we write a secondary set of plans (BOM/OOPs) specific for the joinery and assembly operations?	• Advanced projects have such complicated joinery and assembly processes and will need their own specific plan.

Behavioral Objectives/Learning Outcomes	**Standards (NJSLS)**
• Draw an orthographic drawing of the hardwood mitered spline tray or advanced joinery project	9.3.ST-ET.2
• Create a Bill of Materials from the orthographic drawing.	9.3.ST-ET.2
• Create an Order of Operations	9.3.ST-ET.2
• Utilize milling machines to safely mill the wood into dimensioned stock	9.3.12.AC-CST.5
• Accurately layout and cut joinery utilizing joinery techniques and procedures.	9.3.ST.6
• Assemble the wooden tray or advanced joinery project using situation appropriate assembly procedures	9.3.ST.6

• Apply the wood finishing process to the tray or advanced joinery project	9.3.ST.6
• Reflect upon the experience and woodworking process.	9.3.ST-SM.3

Interdisciplinary Connections
Math, Science, Manufacturing, Vocational

21st Century Skills
Critical thinking, communication skills, creativity, problem solving, perseverance, collaboration, information literacy, technology skills and digital literacy, media literacy, global awareness, self-direction, social skills, literacy skills, civic literacy, social responsibility, innovations skills, thinking skills

Writing Assignments
Project Reflection

Activities, Instructional Strategies, and Assignments
Orthographic Drawing Bill Of Materials Order of Operations Mill dimensioned lumber checkpoint Layout Checkpoint Fabrication Checkpoint Router manipulative and Written Quiz Assembly Checkpoint Finishing Checkpoint Reflection Activity and Slide

Accommodations and Modifications (BHPRSD Accommodations and Modifications)
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curricular areas
- Provide guiding questions to complete during the activity
- Provide chunking of instructional notes and activities to allow for formative assessment (checks for understanding) before moving on to the next stage
- Choose cooperative learning groups to ensure effective work, maximize productivity and support socialization
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- Highlight distinctive features/key concepts
- Provide choice of projects depending on the student's interests or strengths
- Provide peer assistance/study groups
- Review, repeat, and clarify directions
- Chunk sections of assessment
- Allow for partial credit, when appropriate
- Allow use of familiar contexts to demonstrate understanding of key concepts when use of text evidence is not necessary
- Provide general assistance with organizational skills
- Utilize homework assignment notebook/planner/agenda
- Provide written intermediate timelines for long assignments
- Have student monitor grade average
- Keep rules simple and clear
- Implement a behavior management system

Formative Assessments

- Written Router Quiz
- Orthographic drawing
- Bill of Materials
- Order of Operations

Summative Assessments

- Mitered spline joint tray

Performance Assessments

- Safe operation of milling and fabrication machines.
- Efficient operating procedures of assembly process
- Diligent application of finishing process

RETURN TO CALENDAR

RETURN TO UNIT SUMMARIES

Unit 4:	Project Planning and Ownership

Unit Summary
Students will work in groups to choose a project from the list. The students will work together to plan, mill, fabricate, assemble, and finish the projects.

Essential Questions	**Enduring Understandings**
• What type of information can we reveal about a potential project through research?	• Many features and options of a project can be revealed through research. We must research the overall project idea, materials needed, the joinery possibilities, size and dimension options, strength requirements, finish requirements.
• How can we integrate this research into our planning process?	• We will utilize the information we have collected to make the 3 project planning documents, Drawing, BOM, and Order of Operations.
• What project specific considerations must be recognized while making your plans?	• Each project has a unique and specific set of considerations including intended use, material, safety, size, and how many are being produced.
• What is the order of machine operations in squaring and dimensioning the stock? • What special fabrication operations must be used to fabricate the complex shapes and joinery? • How will project features affect the assembly and finishing process?	• Rough crosscut, joint edge, rip cut, cross cut the end to properly square a board.. • ;Layout and jig and fixture machine set ups are critical to fabricating complex joinery and shapes. • Size, shape, type of material, intended use, time constraints all determine the assembly and finishing details chosen.

Behavioral Objectives/Learning Outcomes	**Standards (NJSLS)**
• Utilize the research and design process to select a project • Research various important elements and options of the project • Create a overall rough plan for the project • Create a mechanical drawings • Create a Bill of Materials • Create an “Order of Operations”	9.3.ST-ET.2
• Safely operate machinery to mill square dimensioned parts • Layout and fabricate the joinery and shapes of the project	9.3.12.AC-CST.5

Interdisciplinary Connections
STEAM, English, Geometry

21st Century Skills
Critical thinking, communication skills, creativity, problem solving, perseverance, collaboration, information literacy, technology skills, self-direction, social skills, literacy skills, innovations skills, thinking skills

Writing Assignments
Bill of Materials Handouts Woodworking Project Research Assignment

Activities, Instructional Strategies, and Assignments
Bill of Materials Cut/Plan List

Accommodations and Modifications (BHPRSD Accommodations and Modifications)

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- Provide general assistance with organizational skills
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- Have student monitor grade average
- Keep rules simple and clear

Formative Assessments

- Bill of Materials
- Plan/Cut List

Summative Assessments

- Choose from assorted basic pine projects like shelves, racks, etc.

Performance Assessments

- Safely utilize all tools and machines

Unit 5:	Structural Joinery

Unit Summary
Students will follow the woodworking process to build a mortise and tenon table or stool. Students will accurately fabricate square parts, complete layout and assemble with structurally appropriate joinery. Students will finish this table to a high degree of refinement.

Essential Questions	**Enduring Understandings**
• How does one organize the steps and plan of the woodworking process?	• The wood working process consists of: ○ Research and development, reading and making plans,, milling, fabrication, assembly, finishing.
• What 3 documents make up a set of plans?	• A sufficient set of mechanical drawings • A Bill of Materials • Order of Operations
• Why is a bill of materials important? • What is an order of operations? • What are the considerations in creating the order of operations?	• A bill of materials is the cut list of the final dimensions of the rectangular stock in the project. This is referred to while milling the stock square to dimension. It can be used to calculate wood volume and material cost. • An order of operations is a detailed list of operations and cuts to perform. • We prioritize Safety, then Accuracy, then Efficiency.when creating an order of operations.
• How can we safely, accurately, and efficiently mill the wood into the dimensioned parts? • How can we accurately create the layout on the wood? • What special operations must be performed to accurately fabricate the piece?	• With total focus and organization we can efficiently take turns milling boards to size. • Precise measurements and layout lines are diligently and carefully drawn using layout tools. • Machine the joinery, curves and more complicated cuts within the parts of the project.
• How will we connect the wooden parts together? • How do we prepare for assembly? • What methods can be used to assemble furniture and wood?	• The Assembly process is used to connect together wooden parts into a project. • We prepare for assembly by doing dry assembly, and gathering and organizing clamps and gluing materials. • The three methods of assembling wood include joinery, glue, and fasteners.
• How do we prepare the wood for finishing? • What are pros and cons of common finishes? • What are the safety concerns with different finishes? • What is a common finishing process?	• We sand with the grain. Sanding the piece 3 times:rough 100, medium150 and smooth 220 grit. We dampen and raise the grain between sanding grits. • There are many finishes and the best finish must be chosen based on intended use, desired look, and specific application. • Different finishes have specific safety protocols. Clean up, fumes, fire, hazardous waste, solvents, skin irritants, carcinogenic materials that may need to be considered.

	• We commonly apply a thinned sealer coat of finish. Then brush a few heavier coats. Once dry the finish is lightly sanded smooth with 320 and steel wool. Thinned down final coats are wiped on. It is smoothed with fine steel wool and then waxed with furniture wax.
• How can we reflect and learn from our experience? • What does the overall woodworking process involve?	• We must learn from our experiences • In woodworking we always follow the woodworking process: Plan, mill, fabricate, assemble, finish.

Behavioral Objectives/Learning Outcomes	**Standards (NJSLS)**
• Students will interpret the plans and draw a front view of the table • Students will interpret the plans and create a “Bill of Materials” • Students will interpret the plans and create a “Order of Operations”	9.3.ST-ET.4
• Students will mill the rough lumber into final dimensioned stock • Students will draw layout of the joinery and shapes • Students will fabricate the dimensioned parts into final shape with special operations. • Students will cut tapers on the table or band saw • Students will assemble aprons and legs • Students will mill and assemble a panel glue up for a top • Students will assemble the top to the base • Students will sand and finish the table following finishing procedures.	9.3.12.AC-DES.6 9.3.12.AC-CST.5

Interdisciplinary Connections
Math, Engineering, science. vocational

21st Century Skills
Critical thinking, communication skills, creativity, problem solving, perseverance, collaboration, information literacy, technology skills and digital literacy, media literacy, global awareness, self-direction, social skills, literacy skills, civic literacy, social responsibility, innovations skills, thinking skills

Writing Assignments
Reflection Slide Order of Operations

Activities, Instructional Strategies, and Assignments

Orthographic Drawing of Table
Bill of Materials
Order of Operations
Mortise and Table Table Project
Reflection Slide

Accommodations and Modifications (BHPRSD Accommodations and Modifications)

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- Implement a behavior management system

Formative Assessments
• Bill of Materials, • Order of Operations • Milling Checkpoint • Layout Checkpoint • Fabrication Checkpoint • Assembly Checkpoint • Finish Checkpoint

Summative Assessments
• Finished Table Assessment

Performance Assessments
• Safely utilize all tools and machines

RETURN TO CALENDAR

RETURN TO UNIT SUMMARIES

Unit 6:	CNC Machining

Unit Summary
Students will be introduced to the CNC machines and by the end of this unit, students will create a VCarve file, safely set up their stock on the CNC Machine, successfully process their design, and clean up and shut down the machine for future use. Students will build a project utilizing one of the CNC machines. A plaque/sign project may be created or joinery, templates, or parts of a project may all be fabricated using the CNC machines.

Essential Questions	**Enduring Understandings**
• How has the CNC Machine changed the manufacturing process? • Compare and contrast how a CNC Machine impacts the design process vs. using hand tools.	• CNC stands for computer numerical control and these machines play an important role in the manufacturing industry. These complex machines are controlled by a computer and provide a level of efficiency, accuracy and consistency that would be impossible to achieve through a manual process. • As a result, manufacturers can produce parts in less time, reduce waste and eliminate the risk of human error. • Only highly skilled and educated people can operate CNC Machines because of their complexity.
• How do you set up, run, break down, and maintain the CNC Machine? • What is the difference between an upcut and downcut bit? • What are some safety rules and considerations you must follow when using the CNC Machine?	• As with other machines in the Woodworking Classroom, the CNC Machine requires knowledge, skill, and some common sense to operate. The tools must be set up the correct way to ensure they run safely and that no damage or injury comes to the machine or the operator. • The CNC Machine operator has to be smarter than the tool. They have to keep an eye out for things that could potentially go awry, especially when plunging down into a material to cut.

Behavioral Objectives/Learning Outcomes	**Standards (NJSLS)**
• Consider how the CNC Machine has changed the manufacturing process. • Describe career opportunities and means to achieve those opportunities related to CNC Machining.	9.3.MN.1 9.3.MN.4
• Identify the parts of the CNC Machine • Correctly prepare the VCarve file • Set up the tooling, clamps, and work piece • Successfully run the VCarve file and produce a final piece • Clean up the machine, run routine maintenance and follow all safety rules while using the CNC Machine • Plan a project utilizing one of the CNC machines - CNC joinery or Sign/Plaque • Fabricate the CNC project or plaque using the chosen CNC machine	9.3.12.AC-CST.9 9.3.MN-HSE.1 9.3.MN-HSE.3

Interdisciplinary Connections
English - Research a CNC Machining-related career and prepare a presentation on that career

21st Century Skills
Critical thinking, communication skills, creativity, problem solving, perseverance, collaboration, information literacy, technology skills and digital literacy, media literacy, global awareness, self-direction, social skills, literacy skills, civic literacy, social responsibility, innovations skills, thinking skills

Writing Assignments
Write an Order of Operations for the CNC machine setup and Vcarve process Write a project reflection summary

Activities, Instructional Strategies, and Assignments
Students will ensure that their VCarve file is set up correctly, with the appropriate tooling settings. The CNC Machine requires student's full attention and students will be setting up the CNC Machine, including clamping down their work piece, running the machine and cleaning-up. Students will complete and finish their cnc project.

Accommodations and Modifications (BHPRSD Accommodations and Modifications)

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- Have student monitor grade average
- Keep rules simple and clear
- Implement a behavior management system

Formative Assessments

- Research the chosen project
- Order of Operations for the CNC project
- Bill of materials
- Creating the VCarve file with correct settings
- Clamping and Tool Preparation Checklist

Summative Assessments

- CNC signs or CNC joinery project

Performance Assessments

- Safety checkpoints on the CNC Machine
- Safe operation of the CNC Machine, including set up, running, break down and clean up
- Milling and fabricating the rest of the project
- Safety Checkpoints in all machine usage
- Apply finishing process

RETURN TO CALENDAR

RETURN TO UNIT SUMMARIES

Unit 7:	Advanced Project Development

Unit Summary
Students will choose, plan and execute a significant meaningful project. This project may have historical, technological, environmental, personal, cultural, multidisciplinary, or societal significance and may positively impact the lives of others. Students will research, plan, and develop their project. Students will write a specific order of operations and bill of materials describing the woodworking process in a detailed plan. Students will then mill, fabricate, assemble, finish and present the project to the class.

Essential Questions	**Enduring Understandings**
• How can woodworking help add fulfillment to different areas of life? • What types of woodworking were done throughout time? • What types of woodworking and craft are created throughout the world? • What type of woodworking do you enjoy doing? • What skills and operations must you learn to accomplish the project? • What are the steps in the woodworking process?	• Woodworking can be involved in many areas of our lives as we can use meaningful handmade and custom objects to fit our needs precisely and replace factory made items. • Throughout history and all across the world many types of woodwork and craft are created based on the historical era. • Each project brings a certain set of skills and operations that must be mastered in order to complete the project and at times we chose a project to work on a certain skill. • Planning, milling, fabricating, assembly and finishing are the general steps of the wood working process.
• How can you apply the planning process to this specific project?	• Each project needs its own set of procedures and order of operations specific to the nuances of the project. Break down the project into manageable parts and operations to work through the project on paper.

Behavioral Objectives/Learning Outcomes	**Standards (NJSLS)**
• Research and Brainstorm and present project ideas	9.3.ST-ET.2
• Chose a project and make a rough plan	9.3.ST-ET.2
• Create a final set of plans for the project	9.3.ST-ET.2
• Utilize milling machines to safely the wood into dimensioned stock	9.3.12.AC-CST.5
• Accurately layout and cut joinery utilizing joinery techniques and procedures.	9.3.ST.6
• Assemble the project	9.3.ST.6
• Apply the wood finishing process to the project	9.3.ST.6
• Reflect upon the experience and woodworking process.	9.3.ST-SM.3

Interdisciplinary Connections
Math, Science, Manufacturing, Vocational

21st Century Skills
Critical thinking, communication skills, creativity, problem solving, perseverance, collaboration, information literacy, technology skills and digital literacy, media literacy, global awareness, self-direction, social skills, literacy skills, civic literacy, social responsibility, innovations skills, thinking skills

Writing Assignments
Project Reflection

Activities, Instructional Strategies, and Assignments
Research and Development presentation Orthographic Drawing Bill Of Materials Order of Operations Mill dimensioned lumber checkpoint Layout Checkpoint Fabrication Checkpoint Assembly Checkpoint Finishing Checkpoint Reflection Activity and Slide

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Formative Assessments

- Project Research Presentation
- Orthographic drawing
- Bill of Materials
- Order of Operations
- Milling Checkpoint
- Fabrication Checkpoint
- Assembly Checkpoint
- Finishing Checkpoint

Summative Assessments

- Advanced Intrinsic woodworking Project assessment

Performance Assessments

- Safe operation of milling and fabrication machines.
- Efficient operating procedures of assembly process
- Perform Finishing process to the project

RETURN TO CALENDAR

RETURN TO UNIT SUMMARIES