

MISSION TRAILS REGIONAL OCCUPATIONAL PROGRAM

1. **COURSE TITLE:** Mill Cabinet/Construction Technology
2. **CBEDS TITLE:** Millwork and Cabinetmaking
3. **CBEDS NUMBER:** 5520
4. **JOB TITLES:**
 - Boilermakers,
 - Bricklayers and Stonemasons
 - Cabinetmakers
 - Carpenters (Metal Studs)
 - Carpet, Floor and Tile Installers and Finishers
 - Concrete Technicians
 - Construction Equipment Operators
 - Countertop Fabricators and Installers
 - Drywall Installer and Finishers
 - Electricians
 - Elevator Installation and Repair
 - Finish Carpenters
 - Glaziers
 - Grading and Foundation Workers
 - Hazardous Material Removal Workers
 - Insulation Workers
 - Mill Wright
 - Painters and Paperhangers
 - Plasterer and Stucco Masons
 - Plumbers, Pipe fitters and Steamfitters
 - Roofers/Waterproofing
 - Sheet metal Workers and Duct/HVAC Installers
 - Structural and Reinforcing Metal Workers
 - Wood Finishers
5. **COURSE DESCRIPTION:** Mill Cabinet and Furniture Making is the third in a group of courses. Through a series of individual and group experiences this course is designed to instruct students in the advanced phases of cabinetmaking and furniture making, nomenclature and advanced operational techniques of woodworking and cabinet shop equipment. Students will receive instruction in furniture making, cabinetry, wood and wood by-products and materials use in the construction of furniture. This course is designed to be both vocational and a vocational, depending on the individuals needs and abilities. Students practice communication skills by applying reading, writing, listening, speaking, visual and non-verbal skills. Methods used in achieving the Course Objective include lecture on the course as out-lined, exams and reading assignment, demonstration and laboratory projects. Methods of evaluating objectives or outcomes include 3-4 examinations, a project, a final examination and participation and attendance. Students require minimum materials such as a notebook, shop coat or apron, tape measure and pencil. Personal Protective Equipment.

- 6. HOURS:** 860 Total, 10 hours per week
- 7. PREREQUISITES:** 1 year Woodshop or Instructors Approval
- 8. REVISION DATE:** May 6, 2008
- 9. CDE RECERTIFICATION:** January 12, 2004

10. MAJOR CONCEPTS:

- I. Shop Safety
 - 1. Orientation
 - 2. Personal Safety
 - 3. Worksite Safety
 - 4. Classroom Procedures
- II. Project Planning and Layout
 - 1. Shop Math
 - 2. Orthographic Drawing
 - 3. Measuring Tools
- III. Tool and Machine Usage
 - 1. Hand Tools
 - 2. Portable Power Tools and Machines
- IV. Nature and Properties of Wood
 - 1. Growth of a Tree
 - 2. Lumber Industry
 - 3. Seasoning Lumber
 - 4. Wood Identification
 - 5. Fine Furniture Woods
- V. Plywood and Wood By-Products
 - 1. Advantages of Plywood
 - 2. Plywood Construction
 - 3. Hardboard and Particle Board
- VI. Fasteners
 - 1. Nails, Brads and Staples
 - 2. Screws
 - 3. Miscellaneous and Special Fasteners
- VII. Adhesives
 - 1. Kinds of Glues
 - 2. Uses of Glues
 - 3. Cements
- VIII. Abrasives
 - 1. Kinds of Abrasive Materials
 - 2. Uses of Abrasive Materials
- IX. Furniture Finishing
 - 1. Choice of Finishes
- X. Hardware
 - 1. Selection and Installation of Hardware

COURSE OUTLINE:

a. CONTENT AREA SKILLS:

i. EXPECTED STUDENT OUTCOMES

ii. HOURS OF INSTRUCTION

COURSE OUTLINE

CONTENT AREA SKILLS	EXPECTED STUDENT OUTCOMES	HOURS		
		CL	CC	C P
Instruction will include:	Student will be able to:			
I. <i>Shop Safety</i> - To make students aware of the general classroom safety procedures in the shop and the possible consequences.	1. Orientation <ul style="list-style-type: none"> a) Be aware of Shop Rules b) Identify major concepts of the grading policy 2. Personal Safety <ul style="list-style-type: none"> a) Actively participate in student personal organization (shop fees, cleanup and storage) 3. Worksite Safety <ul style="list-style-type: none"> a) Pass General Shop Safety and Tests, and demonstrate shop safety b) Understand the importance of worksite safety 4. Classroom Procedures <ul style="list-style-type: none"> a) Obtain parental acknowledgement of liability 	75	10	
II. <i>Project Planning and Layout</i> - To instruct the students in the use of the English system of linear measurement; To show how fractions are used in the trades; To Show how to determine surface area; To show the students how to determine the volume of a non-cylindrical piece; How to determine material costs; to develop record keeping system for woodworking; to demonstrate how to develop geometric shapes; demonstrate how to divide an angle using a compass or a protractor; to demonstrate how to use a sliding T-bevel or a protractor to copy an angle; to demonstrate the necessity for jigs and the method for laying them out; to show importance of designing for affordability; and the make students aware of the relationship between skills,	1. Shop Math <ul style="list-style-type: none"> a) Be able to identify the divisions of an inch, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$ and $\frac{1}{32}$ b) Be able to determine in which the scale and the rule is marked c) Be able to mark objects within $\frac{1}{32}$ of an inch d) Convert fractions to a common denominators e) Be able to add both like and unlike fractions f) Be able to subtract fractions g) Multiply fractions h) Divide fractions i) Given the length and width of a piece of stock be able to find the area j) With the area in square inches, convert it to area in square feet k) With the area in square feet and the cost per square foot, to calculate the cost l) Given the thickness, width, and length, determine the board feet in a piece of stock m) Use fractions to determine board feet n) Use a calculator to determine board feet o) Multiply length times cost per foot to determine total cost p) Find area, convert to square feet and multiply time cost per square foot 	150	20	

<p>salary, and living expenses; To demonstrate the development of a storypole; to demonstrate the development of a working drawing; To identify and demonstrate the proper use of measuring tools.</p>	<p>q) Find the board feet and multiply times cost per board foot r) To make materials list of the sketch s) Find material cost t) Find hardware cost u) Find labor costs v) Estimate cost of shop time w) Make cost comparison x) Layout squares, rectangles, parallelograms, triangles, circles and polygons y) Divide angles using a compass z) Divide angles using a protractor aa) Copy angle from a layout using a sliding T-bevel bb) Use sliding T-bevel to set saw blade or miter gauge cc) Use a protractor to transfer an angle dd) Use Bill of Materials to record costs ee) Use receipts to keep hardware costs ff) Use records to record total costs gg) Determine cost range for particular item hh) Design for the best and most economical ii) Design for hardware to cut costs jj) Compare wages and salary between skilled and unskilled labor kk) Determine difference between gross and net salaries ll) Determine the costs of benefits and how it effects salaries</p> <p>2. Orthographic Drawing</p> <p>a) Cut 1"x2" pole to the greatest dimension of the cabinet. b) Using one 2' face the students will locate all vertical members of a cabinet. c) Using the edge of the pole, the student will locate a horizontal member of a cabinet. d) Develop a drawing showing ends of the carcass (height, width, and placement of joints, type of joints and kick). e) Develop a drawing showing the front of the carcass (kick, dividers, and top). f) Develop a drawing showing the top of the carcass (face frame, installation of the back and depth). g) Develop a drawing showing the bottom of the carcass (placement of supports, placement of dividers and types of joints). h) Develop a drawing showing the face frame (all vertical members, all horizontal members, and how they are joined).</p> <p>3. Measuring Tools</p> <p>a) Tape measure and ruler b) Squares c) Marking Gauge</p>	<p>40</p> <p>14</p>	<p>10</p> <p>5</p>	
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	<ul style="list-style-type: none"> d) Sliding T-bevel e) Protractor 			
<p>III. <i>Tool and Machine Usage</i> - To instruct students of the proper safe use, care and maintenance of woodworking handtools, portable power tools and woodworking machinery.</p>	<ol style="list-style-type: none"> 1. Hand Tools <ul style="list-style-type: none"> a) Identify and demonstrate correct use of saws (rip, crosscut, coping, back and dovetail). b) Identify and demonstrate correct use of the planes (block, jack, rabbet, spoke shave and sharpening). c) Identify and demonstrate correct use of shaping tools (files and rasps, chisels, gouges and utility knives and surform files). d) Identify and demonstrate correct use of hammers and mallets (claw, rawhide. Rubber and ballpeen). e) Identify and demonstrate correct use of screwdrivers (slot, Phillips and power drivers). f) Identify and demonstrate correct use of nail sets. g) Identify and demonstrate correct use of cabinet scrapers. 2. Portable Power Tools and Machines <ul style="list-style-type: none"> a) Demonstrate safe and correct use of Radial Arm Saw (crosscutting, multiple cut to length and ripping). b) Demonstrate safe and correct use of Planer (determine direction of grain and account for hardness of stock for depth of cut) c) Demonstrate safe and correct use of Jointer (set in-feed table for depth of cut, grain direction, set fence and guard and joint a face). d) Demonstrate safe and proper use of Table Saw (use the table saw and fence, guard and push stick to safely rip stock, use miter gauge to cut stock to length, use a guide to cut multiple pieces to length, set up dados of varying widths using Dado set and safely cut Dado joints and using same dados cut rabbet joints). e) Demonstrate safe and proper use of Band Saw (layout a curved or irregular pattern, set guides and guards, make relief cuts, follow an irregular pattern and set up guide and re-saw stock for thickness). f) Demonstrate safe and proper use of the Scroll Saw (prepare stock for an inside cut, install the blade, tension the blade and set the speed). g) Demonstrate safe and proper use of the Drill Press (choose proper bit for job, use stop to limit depth of cut, set table in proper position and at proper angle for desired hole, and select proper speed for cutter and material). h) Demonstrate safe and proper use of Horizontal Boring Machine (select proper use for dowel joint, layout for dowel joint, drill and assemble a dowel 	200	60	

	<p>joint).</p> <p>i) Demonstrate safe and proper use of the Lathe and Face Plate (layout a pattern for a turned spindle, prepare the stock for turning, select proper speed, set the tail-stock and tool-rest, turn stock to round and copy the pattern, layout and prepare piece to mount on faceplate, mount stock and select speed and set tool rest and turn).</p>			
<p>IV. <i>Nature and Properties of Wood</i> - To identify nature and property of wood. Identify the parts of a tree. Identify and discuss use of the parts of a tree in the lumber industry. Discuss how lumber is dried. Discuss how to identify different types of wood. Discuss wood commonly used in the furniture and cabinet industry.</p>	<p>1. Growth of a Tree</p> <p>a) Student will learn about the growth of a tree (identify the bark, the sapwood, the heartwood, the pith and the annual rings).</p> <p>2. Lumber Industry</p> <p>a) Student will learn wood identification (hardwoods, softwoods and different types of woods).</p> <p>3. Seasoning Lumber</p> <p>a) Student will identify and discuss wood defects (knots, checks and cracks, sap pockets, warps and the grading and ordering of wood).</p> <p>4. Wood Identification</p> <p>a) Identify and discuss wood types used in building fine furniture and cabinets (pro's and con's of hardwoods and softwoods).</p> <p>5. Fine Furniture Woods</p> <p>a) Identify and discuss the grading and ordering of fine woods.</p>	15	5	
<p>V. <i>Plywood and Wood By-Products</i> - To make student aware of plywood and wood by-products, the advantages of using plywood, plywood construction and the use of fiberboard and particle board in the industry.</p>	<p>1. Advantage of Plywood</p> <p>a) Advantages of plywood.</p> <p>b) Strength and cost advantages.</p> <p>c) Use in furniture and cabinetmaking industry.</p> <p>2. Plywood construction</p> <p>a) Identify different types of plywood.</p> <p>b) Identify interior and exterior plywood and different adhesives used.</p> <p>3. Hardboard and Particle Board</p> <p>a) Identify fiberboard and particleboard.</p> <p>b) Identify what these products are made from.</p> <p>c) Identify what uses they have in the industry.</p> <p>d) Understand the use of Melamine in the cabinet and furniture industry.</p>	15	5	
<p>VI. <i>Fasteners</i> - To make students aware of the various types of fasteners used in the industry.</p>	<p>1. Nails</p> <p>a) Identify different types of nails, brads and staples used in the industry.</p> <p>b) Demonstrate the proper use of nail instead of staples.</p> <p>2. Screws</p> <p>a) Identify different types of screws used in the industry.</p> <p>3. Miscellaneous and Special Fasteners</p> <p>a) Identify when a specialty fastener is to be used.</p>	6	5	

<p>VII. <i>Adhesives</i> - To make students aware of different adhesives used in the industry. Present the pros and cons of water based adhesives vs. thinner based adhesives. To demonstrate clamp usage. Describe the gluing process and how adhesives dry.</p>	<ol style="list-style-type: none"> 1. Kinds of Glue <ol style="list-style-type: none"> a) Identify the type of adhesive to be used on a particular product. b) Use the appropriate application. c) Understand curing time. d) Identify and correctly use clamps (c-clamps, bar clamps, belt clamps, parallel jaw clamps, miter clamps, spring clamps). 2. Uses of Glues <ol style="list-style-type: none"> a) Demonstrate the use of pressure sensitive adhesives. 3. Cements <ol style="list-style-type: none"> a) Proper use of contact adhesive. b) Demonstrate proper use of plastic resin glues. 	15		
<p>VIII. <i>Abrasives</i> - To demonstrate the types of abrasive materials and grits available, and the use of portable sanding machines.</p>	<ol style="list-style-type: none"> 1. Kinds of Abrasive Materials <ol style="list-style-type: none"> a) Select material types to be used. 2. Uses of Abrasive Materials <ol style="list-style-type: none"> a) List grits and order of use. b) List, which machines will be used with which materials. c) Sand furniture or cabinet projects. 	10		
<p>IX. <i>Furniture Finishing</i> - To demonstrate the types of finishes and methods of applying them. To demonstrate different finishes and application method (lacquer, polyurethane, enamel and oil).</p>	<ol style="list-style-type: none"> 1. Choice of Finishes <ol style="list-style-type: none"> a) Make samples panels 4"x6" of each material and method of application. b) Record on each sample the type of finish, brand, application technique and other pertinent information. c) Compare sample and determine finish and method of application for cabinet. 	25	10	
<p>X. <i>Hardware</i> - To demonstrate the types of hardware and the selection process. To demonstrate how to install various types of hardware.</p>	<ol style="list-style-type: none"> 1. Selection and Installation of Hardware <ol style="list-style-type: none"> a) Select hardware to be used. b) List the tools that will be used during the installation process. 	10	10	

Lab Time:	430 approximate hours (projects)
Lecture:	110 hours
Exams and Reading Assignments	45 hours
Demonstrations	135 hours
	720 hours

COURSE OUTLINE:

b) CAREER PERFORMANCE STANDARDS

- i) EXPECTED STUDENT OUTCOMES
- ii) HOURS OF INSTRUCTION

COURSE OUTLINE

CAREER PERFORMANCE STANDARDS	EXPECTED STUDENT OUTCOMES	CLASSROOM HOURS
Instruction will include:	Student will be able to:	
<p>1. Personal Skills</p> <ul style="list-style-type: none"> ▪ Classroom policies & procedures ▪ Ethics <ul style="list-style-type: none"> → Work → Business ▪ Sexual harassment laws ▪ Personal skills, including positive attitude, self-confident, honesty, perseverance & self-discipline ▪ Professional appearance ▪ Time management ▪ Lifelong learning 	<p>1. Understand how personal skill development, including positive attitude, honesty, self-confidence, time management, & other positive traits affect employability.</p> <ul style="list-style-type: none"> ▪ Demonstrate and understand classroom policies & procedures ▪ Define work and business ethics & demonstrate the importance of ethical standards & social responsibilities in the business environment. ▪ Discuss the laws applicable to sexual harassment & discuss tactics for handling harassment situations. ▪ Demonstrate personal skills in class and/or business environment: <ul style="list-style-type: none"> → Positive attitude → Self-confidence → Honesty → Perseverance → Self-discipline ▪ Demonstrate and model personal hygiene and acceptable professional attire ▪ Prioritize tasks and meet deadlines ▪ Explain the importance of lifelong learning 	<p>Integrated in content area skills</p> <p style="text-align: center;">10</p>

CAREER PERFORMANCE STANDARDS	EXPECTED STUDENT OUTCOMES	HOURS
Instruction will include:	Student will be able to:	
<p>2. Interpersonal Skills</p> <ul style="list-style-type: none"> ▪ Group dynamics ▪ Conflict resolution and negotiation ▪ Team work ▪ Etiquette across gender and cultural groups 	<p>2. Understand principles of effective interpersonal skills, including group dynamics, conflict resolution, and negotiation.</p> <ul style="list-style-type: none"> ▪ Identify and explain the key concepts of group dynamics ▪ Discuss and demonstrate the dynamics of conflict resolution and negotiation, and their importance within the business environment ▪ Demonstrate effective teamwork, share responsibilities, accept supervision and assume leadership roles ▪ Demonstrate cooperative working relationships and proper etiquette across gender and cultural groups 	<p>Integrated in content area skills</p> <p style="text-align: center;">25</p>
<p>3. Thinking and Problem-Solving Skills</p> <ul style="list-style-type: none"> ▪ Critical and creative thinking skills ▪ Logical reasoning and problem-solving skills ▪ Numerical estimation, measurement, and calculation ▪ Identify, locate, and organize needed information and propose, evaluate, and select alternative solutions 	<p>3. Understand the importance of critical thinking and problem-solving skills in the workplace.</p> <ul style="list-style-type: none"> ▪ Apply critical and creative thinking skills in a work environment and implement a plan of improvement as needed ▪ Demonstrate logical reasoning and problem solving skills in a work environment ▪ Apply numerical estimation, measurement and calculation skills to business applications including the following: <ul style="list-style-type: none"> → Whole number math → Decimals & fractions → Counting & monetary functions → Use of tables & graphs ▪ Recognize problem situations; identify, locate and organize needed information, and propose, evaluate and select from alternate solutions 	<p>Integrated in content area skills</p> <p style="text-align: center;">50</p>

CAREER PERFORMANCE STANDARDS	EXPECTED STUDENT OUTCOMES	HOURS
Instruction will include:	Student will be able to:	
<p>4. Communication Skills</p> <ul style="list-style-type: none"> ▪ Written communications ▪ Verbal and Nonverbal communications ▪ Active and effective listening ▪ Proper etiquette in business communications ▪ Writing and editing skills ▪ Use of reference material and handbooks ▪ Oral presentations 	<p>4. Understand principles of effective communication.</p> <ul style="list-style-type: none"> ▪ Read and implement written instructions, technical manuals, written communication, and reference books ▪ Present a positive image of verbal and nonverbal communication through use of appropriate methods ▪ Demonstrate active and effective listening skills through verbal, nonverbal and written feedback ▪ Demonstrate proper etiquette in business communications, including an awareness of requisite for international communications (languages, customs, and time zones) ▪ Demonstrate the following writing and editing skills: <ul style="list-style-type: none"> → Use correct grammar, punctuation, capitalization, vocabulary and spelling → Write, proofread and edit → Select and use appropriate forms of communication ▪ Exhibit a proficiency in the use of reference materials such as dictionary, thesaurus, telephone directory, almanac, zip code directory, and office handbooks 	<p>Integrated in content area skills</p> <p style="text-align: center;">15</p>
<p>5. Occupational Safety</p> <ul style="list-style-type: none"> ▪ Good safety practices 	<p>5. Understand occupational safety issues, including avoidance of physical hazards</p> <ul style="list-style-type: none"> ▪ Model and implement good safety practices including: <ul style="list-style-type: none"> → Avoidance and reporting of physical hazards in the work environment → Safe operation of equipment → Proper handling of hazardous materials 	<p>Integrated in content area skills</p> <p style="text-align: center;">15</p>

<p>6. Employment Literacy</p> <ul style="list-style-type: none"> ▪ Expand awareness of career opportunities ▪ Set employment goals and objectives ▪ Aptitudes, personal characteristics and interests ▪ Develop portfolio to C-TAP standards ▪ Develop interviewing techniques 	<p>6. Understand career paths and strategies for obtaining employment.</p> <ul style="list-style-type: none"> ▪ Explore career opportunities and develop a career plan ▪ Identify steps for setting goals and writing personal goals and objectives ▪ Examine aptitudes related to career options; relate personal characteristics and interests to educational and occupational opportunities ▪ Develop a portfolio to include the following: <ul style="list-style-type: none"> → Letter of Introduction → Cover letter → Resume → Thank you letter → Job application → Licenses, Certificates and Awards → Transcripts → Letters of Recommendation → Work Samples 	<p>Integrated in content area skills</p> <p style="text-align: center;">20</p>		
<p>7. Technology Literacy</p> <ul style="list-style-type: none"> ▪ Apply Industry specific technology ▪ Use Industry specific software ▪ Demonstrate Keyboarding ▪ Accessing information ▪ Lifelong enhancement of technology skills 	<p>7. Understand and adapt to changing technology.</p> <ul style="list-style-type: none"> ▪ Identify and demonstrate use of appropriate technology ▪ Identify and use industry specific software ▪ Demonstrate proficiency in alphanumeric keyboarding ▪ Input and retrieve information ▪ Understand the importance of lifelong learning in adapting to changing technology 	<p>Integrated in content area skills</p> <p style="text-align: center;">5</p>		
		720	140	
		860		

10. ADDITIONAL RECOMMENDED /OPTIONAL ITEMS

- a. **ARTICULATION:** 2+2 Agreement with Hartnell Community College Construction Program.
Revision in process; Completion 6-00

- b. **VOCATIONAL CREDIT:** 20/year

- c. **ACADEMIC CREDIT:** 5 Credits of Math

- d. **INSTRUCTIONAL STRATEGIES:**
 - 1. Assign appropriate text reading
 - 2. Lecture on course material
 - 3. Encourage class participation
 - 4. Select appropriate instruction material
 - 5. Evaluate student's performance
 - 6. Demonstrate correct use of tools (machine, portable, hand)
 - 7. Invite guest speakers
 - 8. Appropriate field trips
 - 9. Assign career center projects
 - 10. Present current event topics
 - 11. Assign integrated projects when appropriate
 - 12. Assign supplemental readings
 - 13. Integrate curriculum with core academics

- e. **INSTRUCTIONAL MATERIALS:**
 - 1. Trade resources: Instructors, Unions, Contractors and Inspectors
 - 2. Material Resources: Building Tools (hand/power), Material necessary for furniture and cabinet construction, Textbook name "Modern Cabinetmaking", William D. Umstadd

- f. **CERTIFICATES:**
Competency Certificate in Cabinetmaking