

MANUFACTURING II

Content Standard 8: Production Systems: Students will understand and be able to demonstrate the methods involved in turning raw materials into usable products

Performance Standard p: demonstrate an ability to safely and accurately use the layout, form, separate, combine, treat and finish tools and processes in manufacturing a product

<i>Unit</i>	<i>Learning Objectives</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
LATHE	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Review lathe safety from Manufacturing 1 ❖ Describe and use 10 safety rules & procedures ❖ Identify the 30 most important parts of the metal lathe and their functions ❖ Calculate algebraically the proper initial spindle speeds machine a variety of materials ❖ Set up the machine tool to produce an assigned project to within tolerances of plus or minus .010” ❖ Set up and perform threading operations (both coarse and fine threads) to specified dimensions ❖ Properly hand grind a single point lathe tool 	<ul style="list-style-type: none"> ❖ Teacher directed class discussion ❖ Note-taking ❖ Text book assignments ❖ Teacher demonstration ❖ Guided practice in laboratory ❖ Worksheets ❖ View video 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Textbook: <u>Fundamentals of Machine Technology</u> ❖ Other References: <u>Machine Tools and Machining Practices</u> ❖ <u>Processes of Manufacturing</u> ❖ Videos <u>Modern Marvels: Machine Tools</u> ❖ <u>How to Knurl</u>

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Content Standard 6: Materials and Processes: Students will know the origins, properties and processing techniques associated with the material building blocks of technology

Performance Standard e: experiment with the alteration of material characteristics

Performance Standard i: produce products with raw and recycled materials by separating forming, combining, conditioning, and finishing

Content Standard 8: Production Systems: Students will understand and be able to demonstrate the methods involved in turning raw materials into usable products

Performance Standard p: demonstrate an ability to safely and accurately use the layout, form, separate, combine, treat and finish tools and processes in manufacturing a product

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HEAT TREATMENT	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Review heat treatment safety procedures from Manufacturing 1 ❖ Describe the proper heat treating procedures for most steels ❖ Correctly harden a piece of steel (to within specs) ❖ Correctly temper a previously hardened piece of steel (to within specs) ❖ Correctly Rockwell test a piece to insure compliance with hardening/tempering procedures ❖ Correctly fuse a black oxide finish to the work piece 	<ul style="list-style-type: none"> ❖ Teacher directed class discussion ❖ Note-taking ❖ Text book assignments ❖ Teacher demonstration ❖ Guided practice in laboratory ❖ Worksheets 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Teacher generated worksheets ❖ Textbook: <u>Fundamentals of Machine Technology</u> ❖ Other References: <u>Machine Tools and Machining Practices</u>

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GENERAL WELDING	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Identify and describe the 5 basic fusion processes <ul style="list-style-type: none"> ▪ GMAW ▪ GTAW ▪ SMA ▪ Oxy/Acetylene ▪ Spot ❖ Define general welding terminology: i.e.: <ul style="list-style-type: none"> ▪ Bead, arc, base, metals, fillet, etc. ❖ Identify 5 basic weld joints <ul style="list-style-type: none"> ▪ Butt joint ▪ T joint ▪ Lap joint ▪ Corner joint ▪ Edge joint 	<ul style="list-style-type: none"> ❖ Teacher directed lecture ❖ Note-taking ❖ Text book assignments ❖ Guided practice in laboratory ❖ Worksheets 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Teacher generated worksheets ❖ Textbook: <u>Fundamentals of Machine Technology</u> ❖ Other References: <u>Machine Tools and Machining Practices</u> ❖ <u>Welding Fundamentals</u> ❖ <u>Forging and Welding</u>

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<i>Unit</i>	<i>Learning Objectives</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
GENERAL WELDING (Continued)	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Read welding symbol system of the American Welding Society i.e.: <ul style="list-style-type: none"> ▪ Groove type, weld type, weld process, location, number of welds, size, strength ❖ Identify 7 basic groove types <ul style="list-style-type: none"> ▪ Square groove ▪ Bevel groove ▪ V groove ▪ J groove ▪ U groove ▪ Flare V groove ▪ Flare bevel groove ❖ Identify 4 basic weld positions <ul style="list-style-type: none"> ▪ Horizontal ▪ Vertical ▪ Overhead ▪ Flat ❖ Identify 10 common welding defects: i.e.: <ul style="list-style-type: none"> ▪ Lack of fusion, lack of penetration, undercut, craters, cracks, porosity, burn-through, icicles, convex beads, whiskers 	<ul style="list-style-type: none"> ❖ Teacher directed lecture ❖ Note-taking ❖ Text book assignments ❖ Guided practice in laboratory ❖ Worksheets 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Teacher generated worksheets ❖ Textbook: <u>Fundamentals of Machine Technology</u> ❖ Other References: <u>Machine Tools and Machining Practices</u> ❖ <u>Welding Fundamentals</u> ❖ <u>Forging and Welding</u>

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GENERAL WELDING (Continued)	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Complete and utilize Welding Safety procedures in the areas of: <ul style="list-style-type: none"> ▪ Electrical safety ▪ Fuel & oxidizer gasses ▪ Inert shielding gasses ▪ Welding environment ▪ Personal physical protection ▪ Special precaution areas 	<ul style="list-style-type: none"> ❖ Teacher directed lecture ❖ Note-taking ❖ Text book assignments ❖ Teacher demonstration ❖ Guided practice in laboratory ❖ Worksheets 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Teacher generated worksheets ❖ Textbook: <u>Fundamentals of Machine Technology</u> ❖ Other References: <u>Machine Tools and Machining Practices</u> ❖ <u>Welding Fundamentals</u> ❖ <u>Forging and Welding</u>

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<i>Unit</i>	<i>Learning Objectives</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
GAS METAL ARC WELDING (GMAW)	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Describe the steps necessary to set up the GMAW welder for operation ❖ Describe the safety concerns specific to GMAW welding practices in the areas of: <ul style="list-style-type: none"> ▪ Personal safety, electrical safety, shield gasses, welding environment, special precautions areas ❖ Set up the GMAW welder and produce at least 3 weldments to specifications observing all safety practices 	<ul style="list-style-type: none"> ❖ Teacher directed lecture ❖ Note-taking ❖ Text book assignments ❖ Teacher demonstration ❖ Guided practice in laboratory ❖ Worksheets ❖ View Video 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Teacher generated worksheets ❖ Other References: <u>Gas Metal Arc Welding Handbook</u> ❖ <u>Welding Fundamentals</u> ❖ <u>Forging and Welding</u> ❖ Video: <u>GMAW</u>

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<p>GAS TUNGSTEN ARC WELDING (GTAW)</p>	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Describe the steps necessary to set up the GTAW welder for operation ❖ Describe the safety concerns specific to GTAW welding practices in the areas of: <ul style="list-style-type: none"> ▪ Personal safety, electrical safety, shield gasses, welding environment, special precautions areas ❖ Set up the GTAW welder and produce at least 3 weldments to specifications observing all safety practices 	<ul style="list-style-type: none"> ❖ Teacher directed lecture ❖ Note-taking ❖ Text book assignments ❖ Teacher demonstration ❖ Guided practice in laboratory ❖ Worksheets ❖ View GTAW Video 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Teacher generated worksheets ❖ Other References: <u>Gas Tungsten Arc Welding Handbook</u> ❖ <u>Welding Fundamentals</u> ❖ <u>Forging and Welding</u> ❖ Video: <u>GMAW</u>

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SHIELDED METAL ARC WELDING (SMA)	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Describe the steps necessary to set up the SMA welder for operation ❖ Describe the safety concerns specific to SMA welding practices in the areas of: <ul style="list-style-type: none"> ▪ Personal safety, electrical safety, welding environment, special precautions areas ❖ Set up the SMA welder and produce at least 3 weldments to specifications observing all safety practices ❖ Select proper welding rod for specific applications (Rod Designation System) 	<ul style="list-style-type: none"> ❖ Teacher directed lecture ❖ Note-taking ❖ Text book assignments ❖ Teacher demonstration ❖ Guided practice in laboratory ❖ Worksheets ❖ View Videos 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Teacher generated worksheets ❖ Other References: <u>Welding Fundamentals</u> ❖ <u>Forging and Welding</u> ❖ Videos: <u>Shielded Stick Metal Arc Welding I & II</u>

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OXY/ACETYLENE WELDING	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Describe the steps necessary to set up & shut down oxy/acetylene welding torches ❖ Describe the safety concerns specific to oxy/acetylene welding practices in the areas of: <ul style="list-style-type: none"> ▪ Personal safety, welding environment, special precautions areas, fuel & oxidizer gasses (fire & explosion safety) ❖ Set up the oxy/acetylene welding torches & produce at least 3 weldments to specifications observing all safety practices 	<ul style="list-style-type: none"> ❖ Teacher directed lecture ❖ Note-taking ❖ Text book assignments ❖ Teacher demonstration ❖ Guided practice in laboratory ❖ Worksheets ❖ View Videos 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Teacher generated worksheets ❖ Other References: <u>Welding Fundamentals</u> ❖ <u>Forging and Welding</u> ❖ Video: <u>Oxy-Acetylene Welding & Brazing</u> ❖ <u>Oxy-Acetylene Cutting</u>

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MILLING	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Define the process of milling ❖ List the 4 major types of millers and the sub-types within each category ❖ Describe the processes each type of miller is used for ❖ Identify the major parts common to vertical and horizontal milling machines ❖ Recognize the major accessories for millers and describe their uses ❖ Recognize at least 15 different milling cutters types and explain their applications 	<ul style="list-style-type: none"> ❖ Teacher directed lecture ❖ Note-taking ❖ Text book assignments ❖ Teacher demonstration ❖ Guided practice in laboratory ❖ Worksheets ❖ View Video 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Teacher generated worksheets ❖ Textbook: <u>Modern Metalworking</u> ❖ Other References: <u>Fundamentals of Machine Technology</u> ❖ <u>Machine Tools and Machining Practices</u> ❖ Video: <u>Computer Numerical Control</u>

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<i>Unit</i>	<i>Learning Objectives</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
MILLING (Continued)	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Calculate algebraically starting cutter RPM for various materials & cutter sizes ❖ Calculate algebraically starting feed rates for various materials & cutter sizes ❖ Square up milling vise to with .001” ❖ Set up a rotary table to with .001” ❖ Tram a vertical milling machine head in 2 planes to within .001” ❖ Set up & operate both vertical & horizontal milling machines to produce required project work 	<ul style="list-style-type: none"> ❖ Teacher directed lecture ❖ Note-taking ❖ Text book assignments ❖ Teacher demonstration ❖ Guided practice in laboratory ❖ Worksheets ❖ View Video 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Teacher generated worksheets ❖ Textbook: <u>Modern Metalworking</u> ❖ Other References: <u>Fundamentals of Machine Technology</u> ❖ <u>Machine Tools and Machining Practices</u> ❖ Video: <u>Computer Numerical Control</u>

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BLUE PRINT READING	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Identify the common drafting elements utilized in blueprint reading i.e.: <ul style="list-style-type: none"> ▪ <i>Alphabet of lines</i>, object lines, hidden lines, extension lines, dimension lines, center lines, break lines, etc. ▪ <i>Orthographic views</i>, front, top, bottom left & right side, rear view ▪ <i>Extraction data</i>, what dimensions & data can be obtained from orthographic views ▪ <i>Isometric and Auxiliary views</i> ▪ <i>Title block information</i> ❖ Read & interpret a typical machinist's working drawing ❖ Read & interpret a simple blueprint 	<ul style="list-style-type: none"> ❖ Teacher directed lecture ❖ Note-taking ❖ Text book assignments ❖ Teacher demonstration ❖ Guided practice in laboratory ❖ Worksheets 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Teacher generated worksheets ❖ Textbook: <u>Fundamentals of Blueprint Reading</u> ❖ Other References: <u>Fundamentals of Machine Technology</u> ❖ <u>Machine Tools and Machining Practices</u>

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Performance Standard I: Students will produce products with raw and recycled materials by separating, forming, combining, conditioning and finishing.

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SURFACE GRINDER	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Employ all safety practices when using a surface grinder ❖ List the 5 principle abrasives with their general areas of best use ❖ List the 4 principle bonds with the types of applications where they are most used ❖ Identify the 4 most commonly used shapes of grinding wheels ❖ Interpret wheel shape and size markings together with the 5 basic symbols of a wheel specification into a description of the grinding wheel 	<ul style="list-style-type: none"> ❖ Note-taking ❖ Text book assignments ❖ Teacher demonstration ❖ Guided practice in laboratory 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Teacher generated worksheets ❖ Textbook: <u>Modern Metalworking</u> ❖ Other References: <u>Fundamentals of Machine Technology</u> ❖ <u>Machine Tools and Machining Practices</u> ❖ <u>Processes of Manufacturing</u>

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SURFACE GRINDER (Continued)	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ List the steps in and demonstrate how to check a grinding wheel for soundness ❖ List the steps in mounting a wheel and starting a machine safely ❖ True a grinding wheel ❖ Describe contour dressing ❖ List 3 principle jobs of grinding fluid ❖ Use a surface grinder ❖ Name the components of the horizontal spindle surface grinder and describe their function 	<ul style="list-style-type: none"> ❖ Note-taking ❖ Text book assignments ❖ Teacher demonstration ❖ Guided practice in laboratory 	<ul style="list-style-type: none"> ❖ Teacher generated written quizzes and exams ❖ Laboratory performance ❖ Self evaluation of laboratory performance 	<ul style="list-style-type: none"> ❖ Laboratory equipment ❖ Teacher generated worksheets ❖ Textbook: <u>Modern Metalworking</u> ❖ Other References: <u>Fundamentals of Machine Technology</u> ❖ <u>Machine Tools and Machining Practices</u> ❖ <u>Processes of Manufacturing</u>

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Content Standard 3: Career Awareness: Students will become aware of the world of work and its function in society, diversity, expectations, trends and requirements.

Performance Standard a: identify career opportunities in the areas of transportation, communications, production and biotechnology

Performance Standard f: identify future labor market trends

<i>Unit</i>	<i>Learning Objectives</i>	<i>Sample Activities</i>	<i>Assessment Strategies</i>	<i>Resources</i>
CAREERS IN MANUFACTURING	<p><i>Students will</i></p> <ul style="list-style-type: none"> ❖ Identify careers in manufacturing in CT, US and globally ❖ Identify present and future opportunities in manufacturing ❖ Identify trends in manufacturing 	<ul style="list-style-type: none"> ❖ Visitation to WHS Career Center ❖ Internet research ❖ View DVD from CBIA 	<ul style="list-style-type: none"> ❖ Independent report grades using School-wide Rubric 	<ul style="list-style-type: none"> ❖ State of CT DOL website ❖ DOL Occupational Handbook in Wolcott High School Career Center ❖ DVD CBIA

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White, Warren T., et al. **Machine Tools and Machining Practices, Vol. 1**. New York: John Wiley & Sons, 1977

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