Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA100 ORIENTATION / SAFETY
Unit Number: PA-100
Dates: Spring 2013 **Hours:** 10.00

Unit Description / Objectives:

Student will know and be able to list the requirements and where to obtain information for the various machining technology occupations and state the industry and employer expectations of an employee.

Student will also know and be able to determine the importance of shop safety, recognize and correct unsafe work practices and apply safe working practices while working in the shop.

Tasks:

PA101 - Describe the Occupational Safety and Health Administration (OSHA) and its role in the machining industry.

PA102 - Identify & explain safety equipment and procedures.

PA103 - Identify & explain general safety precautions.

PA104 - Identify & describe personal/lab safety requirements.

PA105 - Explain Right to Know Law.

PA106 - Explain location of MSDS.

PA107 - Explain potential hazardous trade materials.

L108 - Identify and explain location of MSDS

L109 - Identify and explain potential hazardous trade materials.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
13.1.11A Relate careers to individual interests, abilities and aptitudes

Focus Standard/Anchor #2

- CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Supporting Standards/Anchors

CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

Connecting Standard/Anchor

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.

Instructional Activities:

Knowledge:

Read and study the Student / Parent Hand Book
Participate in the Student Hand book Assembly by answering questions, taking notes, etc
Listen to and observe the oral presentation and demonstration
Fill out and complete all forms

Skill:

Define OSHA and describe its purpose
Define NIOSH and describe its purpose
Describe appropriate clothing for a machining environment
Identify appropriate PPE used in a machining environment
Describe the proper housekeeping for a machining environment
Describe the purpose of lockout/tagout procedures
Define the terms NFPA and HMIS
Identify and interpret NFPA and HMIS labeling systems
Define the term MSDS
Identify and interpret MSDS terms
Interpret MSDS information
Select the proper fire extinguisher application

Remediation:

Re-teach major concepts
Review with teacher assistance
Study group
Retest or alternative assessment
Technology integration
Study guides
Computer assisted instruction
Checklists

Enrichment:

Upon completion students will move to the next task/assignment
Repeat tasks to enhance skill

Safety:

Student must:
Wear safety glasses, work shoes, and shop coat
Remove all jewelry
Handle material in a safe and work like manner

Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student / Parent Hand Book Test
Worksheets
Quizzes
Pre/Post Test
Notebook
Competency List
Time Cards

Resources/Equipment:

MCTI Student / Parent Hand Book

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology Workbook. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Instructor's Resource Binder. Delmar Cengage Learning. Clifton Park, NY.

Walker, John. 2004. Machining Fundamentals. The Goodheart-Willcox Company, Inc. New York, New York.

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA200 PERFORMING LAYOUT WORK

Unit Number: PA-200

Dates: Spring 2013 **Hours:** 40.00

Unit Description / Objectives:

Student will know and be able to explain why layouts are needed, identify common layout tools, safely use layout tools, and make a layout.

Tasks:

PA201 Perform layout work for NIMS certification.

PA202 Prepare materials for layout.

PA203 Identify and use basic & precision layout tools.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology

Supporting Standards/Anchors

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
3.4.12.C2 Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Focus Standard/Anchor #2

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.
CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience
CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Connecting Standard/Anchor

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.
CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.

Instructional Activities:

Knowledge:

Participate in the theory lesson by answering questions, taking notes, etc.
Listen to and observe the oral presentation and demonstration
Participate in a study group
Participate in assigned project work
Complete computer assisted instruction assignments
Read and study the chapter paying attention to the illustrations
Participate in the discussion and demonstration of the layout tools they will be using
Complete the "Test Your Knowledge Questions".
Maintain a Notebook

Be able to answer or discuss the following question:
Explain why layouts are necessary

Skill:

Demonstrate proper cleanup of tools, equipment, and work area
Demonstrate that tools are returned to their proper storage locations
Demonstrate that equipment is returned to an appropriate condition and setting
Develop a Process Plan
Demonstrate Safe use of layout tools
Prepare metal for layout
Demonstrate proper use of various layout tools
Demonstrate steps in making a simple layout
Layout angles
Demonstrate the proper use of parallels, V-blocks, and angle plate in layout work
Demonstrate the proper way to use and care for Vernier type layout tools
Care of the surface plate
Observe safety rules when making layouts

Remediation:

Re-teach major concepts
Review with teacher assistance
Study group
Worksheets
Individual tutoring
Group tutoring
Peer tutoring
Study groups
Review games
Retest or alternative assessment
Technology integration
Study guides
Computer assisted instruction
Checklists

Enrichment:

Upon completion students will move to the next task/assignment
Repeat tasks to enhance skill

Safety:

Student must:
Wear safety glasses, work shoes, and shop coat
Remove all jewelry
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Layout of part project
Job sheet
Quizzes
Pre/Post Test
Notebook
Competency List

Time Cards
Writing Activities
Group Projects
Project based assessment
NIMS Level I CNC

Resources/Equipment:

www.nims-skills.org
NIMS credentialing study guides/pretest
Reproducible Masters:
Typical Layout Problem
Steps in Making the Layout
Test Your Knowledge Questions
Sections of clean metal to demonstrate layout techniques
Safety Glasses
Shop Coat
Work Shoes
Fire extinguisher
MSDS Sheets
Ear Plugs
Hand tools
Layout dye
Scribers
Hermaphrodite caliper
Divider
Surface gage
Selection of squares
Combination set
Layout ink (Dykem)
Radius pages
Angle Plate
6" caliper (vernier, dial, or electronic caliper)
Files
Pencil type scriber
C-clamps
Magnifying glass
Center Punch
Layout dividers
Ball penn hammers
Workbench with precision surface plate
Height gage with scribe
Circle Template

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology Workbook. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Instructor's Resource Binder. Delmar Cengage Learning. Clifton Park, NY.

Walker, John. 2004. Machining Fundamentals. The Goodheart-Willcox Company, Inc. New York, New York.

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA300 PART INSPECTION
Unit Number: PA-300

Dates: Spring 2013 **Hours:** 20.00

Unit Description / Objectives:

Student will know and be able to define quality assurance, discuss the purpose of a process plan and describe its major parts, define and discuss the purpose of quality control, discuss the purpose of an inspection plan and describe its key points, define SPC and its purpose, identify and discuss the features of X-bar and R-charts, explain the care of precision measuring tools, describe the process of precision measuring tool calibration, and read precision measuring tools.

Tasks:

PA301 Identify, care and use of precision measuring instruments.

PA302 Calibrate precision measuring instruments.

PA303 Describe methods used for quality control.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

Focus Standard/Anchor #2

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics
CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.

Connecting Standard/Anchor

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.
CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
CC.2.1.7.D.1 Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
CC.2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

Read and study textbook pages and pay particular attention to the illustrations
Participate in the review of the
Complete the "Test Your Knowledge Questions"
Participate in the discussion
Maintain Notebook
Define quality assurance
Discuss the purpose of a process plan and describe its major parts
Define and discuss the purpose of quality control
Discuss the purpose of an inspection plan and describe its key points
Define SPC and its purpose
Identify and discuss the features of X-bar and R-charts
Explain the care of precision measuring tools
Describe the process of precision measuring tool calibration
Read precision measuring tools

Skill:

Demonstrate proper cleanup of tools, equipment, and work area
Demonstrate that tools are returned to their proper storage locations
Demonstrate that equipment is returned to an appropriate condition and setting
Identify and use of precision measuring instruments:
Micrometers
Dial indicator
Vernier caliper
Depth micrometers
Height Gauge
Demonstrate precision measuring tool calibration:
Micrometers
Dial indicator
Vernier caliper
Depth micrometers
Height Gauge
Inspect project work for adherence to blue-print specification

Remediation:

Re-teach major concepts
Review with teacher assistance
Study group
Worksheets
Individual tutoring
Group tutoring
Peer tutoring
Study groups
Review games
Create a chart
Retest or alternative assessment
Technology integration
Study guides
Computer assisted instruction
Checklists

Enrichment:

Upon completion students will move to the next task/assignment
Repeat tasks to enhance skill

Safety:

Student must:
Wear safety glasses, work shoes, and shop coat
Remove all jewelry
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Job sheet
Quizzes
Pre/Post Test
Notebook
Competency List

Time Cards
Writing Activities
Group Projects
Project based assessment
NIMS Level I Measurement material and safety

Resources/Equipment:

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology Workbook. Delmar Cengage Learning. Clifton Park, NY.

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Walker, John. 2004. Machining Fundamentals. The Goodheart-Willcox Company, Inc. New York, New York.

www.nims-skills.org
NIMS credentialing study guides/pretest
Mastercam Cad/Cam Software http://www.mastercam.com/default.aspx

www.nims-skills.org
NIMS credentialing study guides/pretest
Reproducible Masters:
Typical Layout Problem
Steps in Making the Layout
Test Your Knowledge Questions
Sections of clean metal to demonstrate layout techniques
Safety Glasses
Shop Coat
Work Shoes
Fire extinguisher
MSDS Sheets
Ear Plugs
Hand tools
Layout dye
Scribers
Hermaphrodite caliper
Divider
Surface gage
Selection of squares
Combination set
Micrometers
Steel Rules
Dial Indicators
Vernier calipers

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA400 BENCH WORK
Unit Number: PA-400

Dates: Spring 2013 **Hours:** 50.00

Unit Description / Objectives:

Student will know and be able to identify the most commonly used machine shop hand tools, select the proper hand tool for the job, maintain hand tools properly and explain and demonstrate how to use hand tools safely.

Tasks:

PA401 - Demonstrate safety procedures when performing bench work.

PA402 - Cut material with a hand hacksaw.

PA403 - File work to specifications.

PA404 - Cut threads with hand taps and dies.

PA405 - Assemble and disassemble parts.

PA406 - Identify and use bench hand tools.

PA407 - Identify & use a hand arbor and/or hydraulic press.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
3.4.10.E6 Illustrate how manufacturing systems may be classified into types such as customized production, batch production, and continuous production.
3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).
3.4.12.C2 Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Focus Standard/Anchor #2

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience
CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Connecting Standard/Anchor

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.
CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
CC.2.1.7.D.1 Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
CC.2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

Participate in the theory lesson by answering questions, taking notes, etc.
Listen to and observe the oral presentation and demonstration
Participate in a study group

Participate in assigned project work
Complete computer assisted instruction assignments
Read and study the chapter paying attention to the illustrations
Participate in the discussion and demonstration of the layout tools they will be using
Complete the "Test Your Knowledge Questions"
Maintain a Notebook.
Identify Files
Be able to answer or discuss the following question :
Explain why layouts are necessary

Skill:

Demonstrate proper cleanup of tools, equipment, and work area
Demonstrate that tools are returned to their proper storage locations
Demonstrate that equipment is returned to an appropriate condition and setting
Demonstrate safe use of layout tools
Demonstrate how to prepare metal for layout
Demonstrate proper use of various bench work tools
Complete steps needed in making a simple layout
Laying out angles:
45 Degrees
60 Degrees
90 Degrees
Demonstrate proper use of center punch
Demonstrate proper use of divider
Demonstrate proper use of Combination set
Demonstrate proper use of Hermaphrodite caliper
Demonstrate proper use of surface Gage
Demonstrate proper use of hand drill
Demonstrate proper use of taps:
Inch
Metric
Demonstrate proper use of dies:
Inch
Metric
Demonstrate proper use of arbor press
Demonstrate proper use of files:
Single cut
Double cut
Curved tooth
Rasp
Demonstrate the use of parallels, V-blocks, and angle plate in layout work
Proper way to use and care for bench work tools
Care of the surface plate
Observe safety rules to be observed when performing bench work
Proper use of bench work tools

Remediation:

Re-teach major concepts
Review with teacher assistance
Study group
Worksheets
Individual tutoring
Group tutoring
Peer tutoring
Study groups
Review games
Retest or alternative assessment
Technology integration
Study guides
Computer assisted instruction
Checklists

Enrichment:

Upon completion students will move to the next task/assignment
Repeat tasks to enhance skill

Safety:

Student must:
Wear safety glasses, work shoes, and shop coat
Remove all jewelry
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Layout of part project
Job sheet
Quizzes
Pre/Post Test
Notebook
Competency List
Time Cards
Writing Activities
Group Projects
Project based assessment
NIMS Level I CNC

Resources/Equipment:

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology Workbook. Delmar Cengage Learning. Clifton Park, NY.

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Walker, John. 2004. Machining Fundamentals. The Goodheart-Willcox Company, Inc. New York, New York.

NIMS credentialing study guides/pretest
Mastercam Cad/Cam Software http://www.mastercam.com/default.aspx
Reproducible Masters:
Typical Layout Problem
Steps in Making the Layout
Test Your Knowledge Questions
Sections of clean metal to demonstrate layout techniques
Hand tools
Layout dye
Scribers
Hermaphrodite caliper
Divider
Surface gage
Selection of squares
Combination set
Hammer
Files
Hacksaw
Punches
Demonstration on precision layout work, have the following equipment available:
Vernier height gage
right angle plate
parallels
V-blocks
straight edge
Vernier bevel protractor
surface plate
Workbench
Vise

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA 500 DRILL PRESSES
Unit Number: PA-500
Dates: Spring 2013 **Hours:** 56.00

Unit Description / Objectives:

Student will know and be able to select and safely use the correct drills and drilling machine for a given job, make safe setups on a drill press, explain the safety rules that pertain to drilling operations, list various drill series, and sharpen a twist drill.

Tasks:

PA501 - Demonstrate safety precautions when using the drill press.

PA502 - Select and demonstrate proper use of drill work holding devices.

PA503 - Calculate speeds and feeds.

PA504 - Demonstrate the use of center drill.

PA505 - Select correct drill sizes for various application.

PA506 - Pre-drill & ream various size holes.

PA507 - Demonstrate counter boring, spotfacing & countersinking.

PA508 - Pre-drill and tap holes.

PA510 - Sharpen various size twist drills.

PA511 - Select & demonstrate workholding devices.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
3.4.10.E6 Illustrate how manufacturing systems may be classified into types such as

customized production, batch production, and continuous production.
3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).
3.4.12.C2 Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Focus Standard/Anchor #2

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text

Supporting Standards/Anchors

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience
CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes

Connecting Standard/Anchor

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.
CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.

CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
CC.2.3.8.A.3Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

Read and study the chapter
Review the assignment
Complete "Test Your Knowledge Questions."
Maintain Notebook
Define a machine tool
Identify types of drilling machines
Identify variety of drill press machining operations
Identify types of drills and drill sizes
Identify parts of a drill
Identify cutting speeds and feeds and their importance

Skill:

Demonstrate proper cleanup of tools, equipment, and work area
Demonstrate that tools are returned to their proper storage locations
Demonstrate that equipment is returned to an appropriate condition and setting
Demonstrate how drills are mounted in a drill press
Demonstrate use of work-holding devices and setups
Set cutting speeds and feeds and their importance
Demonstrate the following:
Centering round stock in a V-block
Sharpening a twist drill
Methods of safely clamping work on a drill press table
Demonstrate a variety of drill press machining operations:
Drilling
Countersinking
Counterboring
Reaming
Tapping
Spotface
How drill press size is determined
Pre-drill and tap holes
Demonstrate counterboring, spotfacing & countersinking
Pre-drill & ream various size holes

Remediation:

Re-teach major concepts
Review with teacher assistance
Study group
Worksheets
Individual tutoring
Group tutoring
Peer tutoring
Study groups
Review games
Retest or alternative assessment
Technology integration
Study guides
Computer assisted instruction
Checklists

Enrichment:

Upon completion students will move to the next task/assignment
Repeat tasks to enhance skill

Safety:

Student must:
Wear safety glasses, work shoes, and shop coat
Remove all jewelry

Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Layout of part project
Job sheet
Quizzes
Pre/Post Test
Notebook
Competency List
Time Cards
Group Projects
Project based assessment
NIMS Level I Drill Press

Resources/Equipment:

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology Workbook. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Instructor's Resource Binder. Delmar Cengage Learning. Clifton Park, NY.

Walker, John. 2004. Machining Fundamentals. The Goodheart-Willcox Company, Inc. New York, New York.

www.nims-skills.org
An assortment of drilling equipment:
Drills
Fraction Drills
Letter Drills
Taps
Counter sinks
Drill gage
Center finder
Center
Drill
Sleeve
Socket
Drift
Vises
Parallels
Reamers
Spotface tool
Counterbores
Cutting fluid

Raw material should be available for students to use
NIMS credentialing study guides/pretest
Mastercam Cad/Cam Software http://www.mastercam.com/default.aspx
Test Your Knowledge Questions
Reproducible Masters:
How a Drill Cuts
Parts of a Twist Drill
Clamping Work for Drilling
Sharpening a Drill
Centering Round Stock
Counterbored Hole
Spotfaced Hole
Safety Glasses
Shop Coat
Work Shoes
Ear Plugs

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA600 OPERATE GRINDING MACHINES
Unit Number: PA-600

Dates: Spring 2013 **Hours:** 41.00

Unit Description / Objectives:

Student will know and be able to identify the various types of offhand grinders, dress and true a grinding wheel, prepare a grinder for safe operation, use an offhand grinder safely, list safety rules for offhand grinding, explain how precision grinders operate, identify the various-types of precision grinding machines, select, dress, and true grinding wheels, safely operate a surface grinder using various work-holding devices, solve common surface grinding problems, and list safety rules related to precision grinding.

Tasks:

PA601 - Demonstrate knowledge and application of OSHA safety rules using pedestral and surface grinding machines.

PA602 - Identify parts of pedestal grinder.

PA603 - Demonstrate the proper way to test, mount and dress grinding wheels.

PA604 - Grind and sharpen various lathe tools.

PA605 - Grind 60 degree external and internal threading tools.

PA606 - Grind single point radius and parting tool setters.

PA607 - Identify & demonstrate surface grinding safety procedures.

PA608 - Identify parts of surface grinder.

PA609 - Grind surfaces flat & parallel using a magnetic chuck.

PA610 - Grind work surfaces square with a vise or angle plate.

PA611 - Grind precision angles using a sine plate or sine bar.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology

Supporting Standards/Anchors

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
3.4.10.E6 Illustrate how manufacturing systems may be classified into types such as customized production, batch production, and continuous production.
3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).
3.4.12.C2 Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Focus Standard/Anchor #2

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.
CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
Writing
CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience

Connecting Standard/Anchor

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
- CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
- CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
- CC.2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

Read and study textbook pages and pay particular attention to the illustrations.
Participate in the review of the assignment.
Complete the "Test Your Knowledge Questions."
Maintain Notebook.
Participate in the discussion about the following:
The principles of precision grinding and why it is done
Types of surface grinders
How surface grinders operate
The advantages and disadvantages of each type
How they operate
The grinding wheel marking system
How to determine whether a grinding wheel requires dressing
Why a demagnetizer is use
Read and study textbook pages on Grinding Wheels and Cutting Fluids
How to mount grinding wheels
Types of cutting fluids
Why cutting fluids are required for most grinding operations
How cutting fluids are applied
Read and study textbook pages on Grinding Applications
Preparing a surface grinder for operation.
The procedure for dressing a grinding wheel
Why a magnetic chuck is “ground-in”
Why a piece of oiled paper is placed between the work and the magnetic chuck
The sequence for starting a surface grinder
How to use a paper strip to position the grinding wheel
Grinding edges square and parallel with face sides
Proper way to clean the surface grinder
Creep grinding
Grinding problems and how to correct them
Grinding safety

Skill:

Demonstrate proper cleanup of tools, equipment, and work area
Demonstrate that tools are returned to their proper storage locations
Demonstrate that equipment is returned to an appropriate condition and setting
Set up a surface grinder to demonstrate its operation
Prepare a surface for examination
Demonstrate how to check a grinding wheel for soundness
Prepare a surface grinder for operation
Demonstrate how to dress the grinding wheel, and check the machine for safe operation
Complete worksheets to be completed
Complete textbook reading

Grinding safety
Grind various single point lathe face and turning tools
Sharpen various size twist drills
Grind 30 degree external and internal threading tools
Demonstrate the procedure for dressing a grinding wheel
Mix and apply cutting fluid

Remediation:

Re-teach major concepts
Review with teacher assistance
Study group
Worksheets
Individual tutoring
Group tutoring
Peer tutoring
Study groups
Review games
Create a chart
Retest or alternative assessment
Technology integration
Study guides
Computer assisted instruction
Checklists

Enrichment:

Upon completion students will move to the next task/assignment
Repeat tasks to enhance skill

Safety:

Students must:
Wear safety glasses, work shoes, and shop coat
Remove all jewelry
Practice grinding safety procedures
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Worksheets
Quizzes
Pre/Post Test
Project based assessment
Notebook
Nims Level I Grinding

Resources/Equipment:

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology Workbook. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology.

Instructor's Resource Binder. Delmar Cengage Learning. Clifton Park, NY.

Walker, John. 2004. Machining Fundamentals. The Goodheart-Willcox Company, Inc. New York, New York.

www.nims-skills.org
NIMS credentialing study guides/pretest
Mastercam Cad/Cam Software http://www.mastercam.com/default.aspx
A selection of grinding wheels should
be available for examination and to demonstrate
how to check a grinding wheel for soundness
Reproducible Masters:
Planer-Type Surface Grinders
Rotary-Type Surface Grinders
Grinding Wheel Marking System
Grinding Wheel Shapes
Mounting Grinding Wheels
Creep Grinding
Traverse Grinding
Plunge Grinding
Centerless Grinding
Test Your Knowledge Questions
Color Transparencies (Binder/CD only)

Test Your Knowledge Questions, Workbook: pages
Instructor's Resource: pages Guide for Lesson Planning
Reproducible Masters:
Grinding Machine Operation
Adjusting Grinder Tool Rest
Using Wheel Dressers
Test Your Knowledge Questions
Color Transparency (Binder/CD only)

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA700 OPERATING LATHES

Unit Number: PA-700

Dates: Spring 2013 **Hours:** 62.00

Unit Description / Objectives:

Student will know and be able to describe and demonstrate how to properly operate a lathe, identify the various parts of a lathe, safely set up and operate a lathe using various work-holding devices, sharpen lathe cutting tools, describe how a taper is turned on a lathe, calculate tailstock set over for turning a taper, and safely set up and operate a lathe for taper turning.

Tasks:

PA701 - Identify and demonstrate lathe safety procedures.

PA702 - Mount and true work piece in 3-jaw and 4-jaw chucks.

PA703 - Align centers.

PA704 - Face workpiece.

PA705 - Turn outside diameters.

PA706 - Turn inside and outside diameters to shoulders.

PA707 - Turn tapers.

PA708 - Demonstrate knurling.

PA709 - Part off & groove workpiece.

PA710 - Cut internal and external threads.

PA711 - Demonstrate machine tapping for internal threads.

PA712 - Demonstrate filing & polishing.

PA713 - Demonstrate die thread cutting.

PA714 - Demonstrate boring.

PA715 - Demonstrate various tool holders and their correct use.

PA716 - Demonstrate the use of a collect attachment.

PA717 - Demonstrate the proper lathe maintenance procedure.

PA718 - Demonstrate proper section to attain various speeds and feeds.

PA719 - Demonstrate proper gear selection for threading operations.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
3.4.10.E6 Illustrate how manufacturing systems may be classified into types such as customized production, batch production, and continuous production.
3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).
3.4.12.C2 Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Focus Standard/Anchor #2

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience

Connecting Standard/Anchor

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.
CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
CC.2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

Describe the various forms of screw threads
Read and study textbook pages
Participate in the review of the reading assignment
Complete the "Test Your Knowledge Questions"
Maintain notebook.
Identify the major parts of the lathe
Lathe safety
Define a taper
Identify work holding devices

Skill:

Demonstrate proper cleanup of tools, equipment, and work area
Demonstrate that tools are returned to their proper storage locations
Demonstrate that equipment is returned to an appropriate condition and setting
Set up a lathe to demonstrate knurling
Examine the assortment of knurling tools
Set up lathes to demonstrate filing and polishing
Use of steady and follower rests
Set up lathe to demonstrate the operations.
Examine assortment of boring bars, cutting tools, taps, drills, reamers, and boring bar holders
Cut screw threads on a lathe
Perform:
Drilling on a lathe
Boring on a lathe
Knurling on a lathe
Reaming on a lathe
Demonstrate familiarity with industrial applications of the lathe
Demonstrate different types of knurls and tools
Demonstrate knurling on the lathe
Demonstrate facing on the lathe
Demonstrate part of on the lathe
Demonstrate grooving on the lathe
Demonstrate tapping on the lathe
Demonstrate cutting tapers on lathe tailstock offset
Demonstrate cutting tapers on lathe compound rest offset

Demonstrate cutting tapers on lathe tail stock offset
Demonstrate boring on lathe
Turn outside diameters
Turn inside diameters
Demonstrate use of steady rest and follower rest

Remediation:

Re-teach major concepts
Review with teacher assistance
Study group
Worksheets
Individual tutoring
Group tutoring
Peer tutoring
Study groups
Review games
Retest or alternative assessment
Technology integration
Study guides
Computer assisted instruction
Checklists

Enrichment:

Upon completion students will move to the next task/assignment
Repeat tasks to enhance skill

Safety:

Student must:
Wear safety glasses, work shoes, and shop coat
Remove all jewelry
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Layout of part project
Job sheet
Quizzes
Pre/Post Test
Notebook
Competency List
Time Cards
Group Projects
Project based assessment
NIMS Level I Drill Press

Resources/Equipment:

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology Workbook. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology.

Instructor's Resource Binder. Delmar Cengage Learning. Clifton Park, NY.

Walker, John. 2004. Machining Fundamentals. The Goodheart-Willcox Company, Inc. New York, New York.

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NIMS credentialing study guides/pretest
Mastercam Cad/Cam Software http://www.mastercam.com/default.aspx
Reproducible Masters:
Lathe Operation
Lathe Measurement
Parts of a Lathe
High-Speed Steel Cutting Tools
(nomenclature and shapes)
Sharpening HSS Cutter Bits
Using the Cutter Bit Gage
Calculating Cutting Speeds
Cutting Speed and Feed Problems
Checking Center Alignment
Facing in a Chuck
Test Your Knowledge Questions
Color Transparencies (Binder/CD only)
Safety Glasses
Shop Coat
Work Shoes
Fire extinguisher
MSDS Sheets
Ear Plugs
Magnetic base for dial indicator
Dial indicator
tool posts, and inserts
Thread cutting tool holder and thread tool
Cutting Fluid
Live and dead centers
Drive plate and dog
Knurling tool - medium (diamond)
Lathe drill chuck
Surface Plate
True bar (for aligning centers)

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA800 OPERATE MILLING MACHINES

Unit Number: PA-800

Dates: Spring 2013 **Hours:** 261.00

Unit Description / Objectives:

Student will know and be able to describe how milling machines operate and properly use a milling machine according to industry standards.

Tasks:

PA801 - Identify & demonstrate safety procedures for using a milling machine.

PA802 - Demonstrate tramming of milling head.

PA803 - Select, mount & indicate vise.

PA804 - Machine angles.

PA805 - Machine keyways.

PA806 - Select and demonstrate the use of face mills.

PA807 - Demonstrate the use of a digital indexing procedures.

PA808 - Demonstrate use of digital readout.

PA809 - Demonstrate use of edge finder.

PA810 - Demonstrate climb and conventional milling.

PA811 - Demonstrate use of adjustable boring head.

PA812 - Calculate speeds and feeds.

PA813 - Install and remove cutting tool holding devices properly.

PA814 - Select appropriate cutter for various milling operations

PA815 - Demonstrate how to square part.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

- 3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
- 3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
- 3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
- 3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
- 3.4.10.E6 Illustrate how manufacturing systems may be classified into types such as customized production, batch production, and continuous production.
- 3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).
- 3.4.12.C2 Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
- 3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Focus Standard/Anchor #2

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
- CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
- CC.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context.
- CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
- CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials.
- CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.
- CC.2.2.HS.D.5 Use polynomial identities to solve problems.
- CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.
- CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
- CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
- CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
- CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
- CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
- CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
- CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.

CC.2.2.HS.C.5 Construct and compare linear, quadratic and exponential models to solve problems.
CC.2.2.HS.C.6 Interpret functions in terms of the situation they model.
CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions.
CC.2.2.HS.C.8 Choose trigonometric functions to model periodic phenomena and describe the properties of the graphs.
CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.
CC.2.3.HS.A.1 Use geometric figures and their properties to represent transformations in the plane.
CC.2.3.HS.A.2 Apply rigid transformations to determine and explain congruence.
CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
CC.2.3.HS.A.4 Apply the concept of congruence to create geometric constructions.
CC.2.3.HS.A.5 Create justifications based on transformations to establish similarity of plane figures.
CC.2.3.HS.A.6 Verify and apply theorems involving similarity as they relate to plane figures.
CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
CC.2.3.HS.A.8 Apply geometric theorems to verify properties of circles.
CC.2.3.HS.A.9 Extend the concept of similarity to determine arc lengths and areas of sectors of circles.
CC.2.3.HS.A.10 Translate between the geometric description and the equation for a conic section.
CC.2.3.HS.A.11 Apply coordinate geometry to prove simple geometric theorems algebraically.
CC.2.3.HS.A.12 Explain volume formulas and use them to solve problems.
CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
CC.2.3.HS.A.14 Apply geometric concepts to model and solve real world problems.
CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience
CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Connecting Standard/Anchor

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.
CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
CC.2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

Read and study textbook
Participate in the review of the assignment.
Complete the "Test Your Knowledge Questions"
Maintain Note book
Participate in discussion on the following:
How milling machines work
Types of milling machines
Difference between plain-type horizontal milling machine and universal-type horizontal milling machine
Methods of milling machine control
How to adjust cutting speed and feed
Milling operations
Milling safety practices
Face milling and peripheral milling
Milling cutter classification
Milling cutter material
End mills
Face milling cutters
Fly cutters
Arbor milling cutters
Miscellaneous milling cutters
Care of milling cutters
Methods of milling
How to safely handle milling cutters
Various types of arbors
Installing and removing cutter holding devices from the machines.
Using collets
Care of cutter holding and driving devices
The purpose of cutting fluids and their importance in maintaining optimum cutting action
The advantages and disadvantages of the various types of vises
When a magnetic chuck should be used for milling operations
The use of the rotary and index tables
The dividing head and how it is set up and used

Skill:

Demonstrate proper cleanup of tools, equipment, and work area
Demonstrate that tools are returned to their proper storage locations
Demonstrate that equipment is returned to an appropriate condition and setting
Demonstrate the following:
Demonstrate face milling and peripheral milling
Demonstrate end mills
Identify face milling cutters
Demonstrate Fly cutting
Identify arbor milling cutters
Identification of milling cutters
Demonstrate care of milling cutters
Demonstrate methods of milling
Demonstrate how to safely handle milling cutters
Demonstrate how milling machines work
Identify the different types of milling machines
Explain the difference between plain-type horizontal milling machine and universal-type horizontal milling
Demonstrate methods of milling machine control
Demonstrate how to adjust cutting speed and feed

Demonstrate milling operations
Milling safety practices
Demonstrate face milling and peripheral milling
Demonstrate care of milling cutters
Methods of milling
Demonstrate how to safely handle milling cutters
Installing and removing cutter holding devices from the machines
Using collets
Demonstrate care of cutter holding and driving devices

Remediation:

Re-teach major concepts
Review with teacher assistance
Study group
Worksheets
Individual tutoring
Group tutoring
Peer tutoring
Study groups
Review games
Retest or alternative assessment
Technology integration
Study guides
Computer assisted instruction
Checklists

Enrichment:

Upon completion students will move to the next task/assignment
Repeat tasks to enhance skill

Safety:

Student must:
Wear safety glasses, work shoes, and shop coat
Remove all jewelry
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Layout of part project
Job sheet
Quizzes
Pre/Post Test
Notebook
Competency List
Time Cards
Group Projects
Project based assessment
NIMS Level I Milling

Resources/Equipment:

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology Workbook. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Instructor's Resource Binder. Delmar Cengage Learning. Clifton Park, NY.

Walker, John. 2004. Machining Fundamentals. The Goodheart-Willcox Company, Inc. New York, New York.

Horizontal Milling Machine
Vertical Milling Machine
Cutter Hand (right and left)
Conventional and Climb Milling
Cutting Speeds and Feeds Chart
Rules for Determining Speed and Feed
Test Your Knowledge Questions
Workbook
Instructor's Resource
Cutting Speed and Feed Problems
Color Transparency
Guide for Lesson Planning
Research and Development Ideas
Reproducible Masters:
Mounting End Mills
Using the Edge Finder
Efficiency of Small Diameter Cutter
Straddle Milling
Types of Gears
Gear Nomenclature
Bevel Gear Nomenclature
Shank Milling Cutter
Arbor Milling Cutters
R-8 Collets

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA900 OPERATE POWER SAW

Unit Number: PA-900

Dates: Spring 2013 **Hours:** 29.00

Unit Description / Objectives:

Student will know and be able to correctly identify the various types of sawing and cutoff machines. Student will select the correct machine for the job to be done, safely and properly mount a blade and prepare the machine for use, position the work for the most efficient cutting, and safely operate sawing and cutoff machines.

Tasks:

PA901 - Identify & demonstrate safety procedures for using vertical and horizontal power saws.

PA902 - Demonstrate cutting and welding saw blades.

PA903 - Remove and replace saw blades.

PA904 - Demonstrate 3 tooth rule for selecting blades.

PA905 - Demonstrate accurate sawing.

PA906 - Select and set speeds for various sawing operations.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
3.4.10.E6 Illustrate how manufacturing systems may be classified into types such as customized production, batch production, and continuous production.
3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).
3.4.12.C2 Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and

think abstractly.
3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Focus Standard/Anchor #2

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience
CC.3.6.11-12.B. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Connecting Standard/Anchor

- CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.
CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
CC.2.1.7.D.1 Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
CC.2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

Read and study textbook pages and pay particular attention to the illustrations
Participate in the review of the assignment
Complete the "Test Your Knowledge Questions"
Participate in the discussion
Maintain Notebook
Identify the different types of saw blades
Identify the types of power saws
Power safety

Skill:

Demonstrate proper cleanup of tools, equipment, and work area
Demonstrate that tools are returned to their proper storage locations

Demonstrate that equipment is returned to an appropriate condition and setting
Students will demonstrate their ability to:
Replace a saw blade
Weld a saw blade
Make straight and angular cuts
Calculate and set speed for cutting

Remediation:

Re-teach major concepts
Review with teacher assistance
Worksheets
Individual tutoring
Group tutoring
Peer tutoring
Fishbowl
Retest or alternative assessment
Technology integration
Study guides
Computer assisted instruction
Checklists

Enrichment:

Upon completion students will move to the next task/assignment
Repeat tasks to enhance skill

Safety:

Student must:
Wear safety glasses, work shoes, and shop coat
Remove all jewelry
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Job sheet
Quizzes
Pre/Post Test
Notebook
Competency List
Time Cards
Group Projects
Project based assessment

Resources/Equipment:

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology Workbook. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Instructor's Resource Binder. Delmar Cengage Learning. Clifton Park, NY.

Walker, John. 2004. Machining Fundamentals. The Goodheart-Willcox Company, Inc. New York, New York.

Test Your Knowledge Questions
Workbook
Instructor's Resource
Guide for Lesson Planning
Research and Development Ideas
Reproducible Masters:
Cutoff Saws
Cutting Pressure
Tooth Set and Tooth Shape
Reverse Work after Replacing Blade
Holding Work for Sawing
Test Your Knowledge Questions
Color Transparencies
Vertical & Horizontal Band Saw
Selection of Band saw Blades

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA1000 MAINTAINING MACHINES AND TOOLS

Unit Number: PA-1000

Dates: Spring 2013 **Hours:** 12.00

Unit Description / Objectives:

Student will know and be able to maintain a safe clean working environment; demonstrate proper care of tools and equipment; and maintain, repair, and clean hand tools and machine tools.

Tasks:

PA1001 - Demonstrate proper lubrication and maintenance of machinery.

PA1002 - Clean and store hand tools, cutters, fixtures and attachments.

PA1003 - Inspect & adjust machine guards.

PA1004 - Select, prepare & store coolants, cutting oils or and compounds.

PA1005 - Inspect, clean, & maintain a safe working area.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
3.4.10.E6 Illustrate how manufacturing systems may be classified into types such as customized production, batch production, and continuous production.
3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).
3.4.12.C2 Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Focus Standard/Anchor #2

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

Connecting Standard/Anchor

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.
CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
CC.2.1.7.D.1 Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
CC.2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

Read and study textbook pages and pay particular attention to the illustrations
Participate in the review of the assignment.
Complete the "Test Your Knowledge Questions"
Participate in the discussion
Maintain Notebook

Skill:

Demonstrate proper cleanup of tools, equipment, and work area
Demonstrate that tools are returned to their proper storage locations
Demonstrate that equipment is returned to an appropriate condition and setting
Maintain a safe, clean work area
Check fluid levels in machines, add if necessary
Mix cutting fluid and coolant
Test coolant concentration with refractometer
Store tools in proper location
Perform the duties of tool crib attendant

Remediation:

Re-teach major concepts
Review with teacher assistance

Study group
Worksheets
Individual tutoring
Group tutoring
Peer tutoring
Study groups
Review games
Retest or alternative assessment
Study guides
Checklists

Enrichment:

Upon completion students will move to the next task/assignment
Repeat tasks to enhance skill
Review supply sources
Students can use CNC trade magazine to further their understanding of CNC Machine Operation/ Programing

Safety:

Student must:
Wear safety glasses, work shoes, and shop coat
Remove all jewelry
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Job sheet
Quizzes
Pre/Post Test
Notebook
Competency List
Time Cards
Project based assessment

Resources/Equipment:

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology Workbook. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Instructor's Resource Binder. Delmar Cengage Learning. Clifton Park, NY.

Walker, John. 2004. Machining Fundamentals. The Goodheart-Willcox Company, Inc. New York, New York.

Machine maintenance manuals
Refractometer
Way & Spindle oil
WD 40
Water soluble cutting oil

www.nims-skills.org
NIMS credentialing study guides/pretest
Hand and Machine tools in the Computerized Machine Technology Program

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA1100 METALLURGY
Unit Number: PA-1100

Dates: Spring 2013 **Hours:** 20.00

Unit Description / Objectives:

Student will know and be able to describe the difference between ferrous and nonferrous metals, define an alloy and alloying element, explain how metals are classified, and describe the characteristics of metals.

Student will also know and be able to recognize the hazards that are posed when certain metals are machined, explain the characteristics of some reinforced composite materials, case harden low-carbon steel, explain why some metals are heat-treated, and list safety precautions that must be observed when heat-treating metals.

Tasks:

PA1101 - Identify & explain metals classifications.

PA1102 - Identify & explain metal property applications.

PA1103 - Identify & explain heat-treating and annealing process.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
3.4.10.E6 Illustrate how manufacturing systems may be classified into types such as customized production, batch production, and continuous production.
3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).
3.4.12.C2 Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Focus Standard/Anchor #2

- CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Supporting Standards/Anchors

CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

Connecting Standard/Anchor

- CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.
CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
CC.2.1.7.D.1 Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
CC.2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:
Identify & explain metals classifications
Identify & explain metal property applications
Identify & explain heat-treating processes
Explain why some metals are heat-treated

Skill:
Properly case harden mild steel
Use Rockwell Hardness Tester to correctly test the hardness of metal
Safely heat treat tool steel
Identify & explain metal property applications
Identify & explain metals classifications

Remediation:

- Re-teach major concepts
- Review with teacher assistance
- Study group
- Worksheets
- Individual tutoring
- Group tutoring
- Peer tutoring
- Study groups
- Review games
- Retest or alternative assessment
- Technology integration
- Study guides
- Computer assisted instruction
- Checklists

Enrichment:

- Upon completion students will move to the next task/assignment
- Repeat tasks to enhance skill

Safety:

Student must:

- Wear safety glasses, work shoes, and shop coat
- Remove all jewelry
- Handle material in a safe and work like manner
- Use protective clothing and equipment
- Use hand tools in a safe manner
- Use adequate ventilation when working in enclosed area
- Follow manufacturer's directions when using any product, tool, equipment, etc.
- Use proper safety precautions when using /operating hand tools
- Use tools and equipment in a professional work like manner according to OSHA standards
- Know and follow the established safety rules at all times

Assessment:

- Project based assessment
- Job sheet
- Quizzes
- Pre/Post Test
- Notebook
- Competency List
- Time Cards
- Group Projects
- NIMS Level I Measurement material & safety

Resources/Equipment:

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology Workbook. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Instructor's Resource Binder. Delmar Cengage Learning. Clifton Park, NY.

Walker, John. 2004. Machining Fundamentals. The Goodheart-Willcox Company, Inc. New York, New York.

- Heat treat oven
- Heat treat safety equipment
- Case hardening powder
- Selection of tool steel
- Oil bath
- Water bath
- www.nims-skills.org

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA1200 USE OF CHARTS AND REFERENCES

Unit Number: PA-1200

Dates: Spring 2013 **Hours:** 10.00

Unit Description / Objectives:

Student will know and be able to read and interpret information from reference books and reference charts to solve common shop problems and applications.

Tasks:

PA1201 - Use the numeric decimal equivalent chart.

PA1202 - Use speed and feed charts.

PA1203 - Utilize thread charts.

PA1204 - Demonstrate use of the Machinery's Handbook to locate specific information.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
3.4.10.E6 Illustrate how manufacturing systems may be classified into types such as customized production, batch production, and continuous production.
3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).
3.4.12.C2 Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

2.3.11.A Select and use appropriate units and tools to measure to the degree of accuracy required in particular measurement situations.

Focus Standard/Anchor #2

- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Supporting Standards/Anchors

CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.

CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem

Connecting Standard/Anchor

- CC.2.2.7.B.3Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.

CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.

CC.2.1.7.D.1 Analyze proportional relationships and use them to model and solve real-world and mathematical problems.

CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.

CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

CC.2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

Use the decimal equivalent chart
Utilize thread charts.
Demonstrate use of the Machinery's Handbook

Skill:

Use the decimal equivalent chart
Utilize thread charts
Demonstrate use of the Machinery's Handbook

Remediation:

- Re-teach major concepts
- Review with teacher assistance
- Study group
- Worksheets
- Individual tutoring
- Group tutoring
- Peer tutoring
- Study groups
- Review games
- Retest or alternative assessment
- Technology integration
- Study guides
- Computer assisted instruction
- Checklists

Enrichment:

- Upon completion students will move to the next task/assignment
- Repeat tasks to enhance skill

Safety:

Student must:

Wear safety glasses, work shoes, and shop coat
Remove all jewelry
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Job sheet
Quizzes
Pre/Post Test
Notebook
Competency List
Time Cards
Group Projects
Project based assessment

Resources/Equipment:

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology Workbook. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Instructor's Resource Binder. Delmar Cengage Learning. Clifton Park, NY.

Walker, John. 2004. Machining Fundamentals. The Goodheart-Willcox Company, Inc. New York, New York.

Machinery's Handbook
Tap Drill Chart
Feed & Speed Chart
Thread Chart
www.nims-skills.org
Safety Glasses
Shop Coat
Work Shoes

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA1300 BLUEPRINT READING
Unit Number: PA-1300

Dates: Spring 2013 **Hours:** 25.00

Unit Description / Objectives:

Student will know and be able to identify and interpret title block information and line types and its use and also describe the principle of orthographic projection.

Tasks:

PA1301 - Identify & explain orthographic views and projections.

PA1302 - Demonstrate basic sketching and dimensioning.

PA1303 - Identify & explain the alphabet of lines.

PA1304 - Demonstrate knowledge of dimensioning of machine parts, as well as tolerance and fits.

PA1305 - Calculate material sizes based upon job needs.

PA1306 - Demonstrate knowledge of third angle prosections.

PA1307 - Identify & interpret geometric dimensioning and tolerancing.

L1308 - Identify & explain lines, dimensions, tolerances and fits.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.
3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
3.4.10.E6 Illustrate how manufacturing systems may be classified into types such as customized production, batch production, and continuous production.
3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.C2 Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Focus Standard/Anchor #2

- CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Supporting Standards/Anchors

CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.

CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

Connecting Standard/Anchor

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.

CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.

CC.2.1.7.D.1 Analyze proportional relationships and use them to model and solve real-world and mathematical problems.

CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.

CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

CC.2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:

Identify & explain views and projections
Identify & explain lines, dimensions, tolerances and fits
Calculate material sizes based upon job needs
Identify & interpret geometric dimensioning and tolerancing
Identify and interpret title block information

Identify line types and their uses
Describe the principle of orthographic projection
Identify the three basic views frequently used in engineering drawings
Identify and describe the use of basic symbols and notation used on engineering drawings
Identify isometric views
Identify and describe the use of basic symbols and notation used on engineering drawings
Define tolerance
Identify basic geometric dimensioning and tolerancing (GD&T) symbols

Skill:

Identify & explain views and projections
Demonstrate basic sketching and dimensioning
Identify & explain lines, dimensions, tolerances and fits
Calculate material sizes based upon job needs
Demonstrate understanding of unilateral, bilateral, and limit tolerance
Demonstrate understanding of allowances and classes of fit for cylindrical components

Remediation:

Re-teach major concepts
Review with teacher assistance
Study group
Worksheets
Individual tutoring
Group tutoring
Peer tutoring
Study groups
Review games
Retest or alternative assessment
Technology integration
Study guides
Computer assisted instruction
Checklists

Enrichment:

Upon completion students will move to the next task/assignment
Repeat tasks to enhance skill

Safety:

Student must:
Wear safety glasses, work shoes, and shop coat
Remove all jewelry
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Layout of part project
Job sheet
Quizzes
Pre/Post Test
Notebook
Competency List
Time Cards
Group Projects
Project based assessment
NIMS Level I

Resources/Equipment:

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology Workbook. Delmar Cengage Learning. Clifton Park, NY.

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Instructor's Resource Binder. Delmar Cengage Learning. Clifton Park, NY.

Walker, John. 2004. Machining Fundamentals. The Goodheart-Willcox Company, Inc. New York, New York.

www.nims-skills.org
NIMS credentialing study guides/pretest
Reproducible Masters:
Test Your Knowledge Questions
NIMS Evaluator's Resource Guide
Sampling of assemble and sub-assembly drawings (blueprints)
Safety Glasses
Shop Coat
Work Shoes

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: PA1400 CNC PROGRAMMING

Unit Number: PA-1400

Dates: Spring 2013 **Hours:** 63.00

Unit Description / Objectives:

Student will know and be able to define the term “numerical control;” describe the difference between the incremental and absolute positioning methods; explain the operation of NC (numerical control), CNC (computer numerical control), and DNC (direct or distributed numerical control) systems; and point out how manual and computer-aided programming is done.

Tasks:

PA1401 - Explain and demonstrate CNC safety procedures.

PA1402 - Demonstrate basic use of G & M codes.

PA1403 - Demonstrate use of numerical controls.

PA1404 - Identify & demonstrate use of Cartesian & polar coordinate systems.

PA1405 - Demonstrate absolute & incremental positioning.

PA1406 - Demonstrate the dry or practice run of a CNC program before machining.

PA1407 - Identify & explain advantages & disadvantages of CNC machining.

PA1408 - Calculate & apply machine feeds and speeds.

PA1409 - Set part zero and tool offsets.

PA1410 - Transfer data files to and from a CNC machine.

PA1411 - Identify and demonstrate use of MDI applications.

PA1412 - Program and produce a part using linear and circular interpration.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Standards/Anchors

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.

3.4.10.E7 Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.

3.4.12.B1 Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.
3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.
3.4.12.E7 Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.
3.4.10.E6 Illustrate how manufacturing systems may be classified into types such as customized production, batch production, and continuous production.
3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).
3.4.12.C2 Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Focus Standard/Anchor #2

- CC.3.5.11-12.C. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Supporting Standards/Anchors

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
CC.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context.
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials.
CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.
CC.2.2.HS.D.5 Use polynomial identities to solve problems.
CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.
CC.2.2.HS.C.5 Construct and compare linear, quadratic and exponential models to solve problems.
CC.2.2.HS.C.6 Interpret functions in terms of the situation they model.
CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions.

CC.2.2.HS.C.8 Choose trigonometric functions to model periodic phenomena and describe the properties of the graphs.
CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.
CC.2.3.HS.A.1 Use geometric figures and their properties to represent transformations in the plane.
CC.2.3.HS.A.2 Apply rigid transformations to determine and explain congruence.
CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
CC.2.3.HS.A.4 Apply the concept of congruence to create geometric constructions.
CC.2.3.HS.A.5 Create justifications based on transformations to establish similarity of plane figures.
CC.2.3.HS.A.6 Verify and apply theorems involving similarity as they relate to plane figures.
CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
CC.2.3.HS.A.8 Apply geometric theorems to verify properties of circles.
CC.2.3.HS.A.9 Extend the concept of similarity to determine arc lengths and areas of sectors of circles.
CC.2.3.HS.A.10 Translate between the geometric description and the equation for a conic section.
CC.2.3.HS.A.11 Apply coordinate geometry to prove simple geometric theorems algebraically.
CC.2.3.HS.A.12 Explain volume formulas and use them to solve problems.
CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
CC.2.3.HS.A.14 Apply geometric concepts to model and solve real world problems.
CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience

Connecting Standard/Anchor

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.
CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world and mathematical problems.
CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
CC.2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:
Read and study the textbook assignment
Participate in the review of the assignment using the reproducible masters as overhead transparencies and/or handouts
Complete "Test Your Knowledge Questions"
Participate in the discussion of the following:
Other NC applications
Setting up and programming the NC machine in the shop/lab

Demonstrating the NC machine in the shop/lab
Identify and describe basic CNC motion-control hardward
Describe the Cartesian coordinate system
Describe the polar coordinate system
Describe the absolute and incremental positioning system
Describe the purpose of G- and M-codes
Describe word address
Describe modal codes
Describe what a"block" is in CNC programming
Describe machine motion types

Skill:

Demonstrate proper cleanup of tools, equipment, and work area
Demonstrate that tools are returned to their proper storage locations
Demonstrate that equipment is returned to an appropriate condition and setting
Setting up and programming the NC machine in the shop/lab
Demonstrate the NC machine in the shop/lab
Describe the main components of a CNC program

Remediation:

Re-teach major concepts
Review with teacher assistance
Study group
Worksheets
Individual tutoring
Group tutoring
Peer tutoring
Study groups
Retest or alternative assessment
Technology integration
Study guides
Computer assisted instruction
Checklists

Enrichment:

Students can use CNC trade magazine to further their understanding of CNC Machine Operation/ Programing
Repeat tasks to enhance skill

Safety:

Student must:
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Job sheet
Quizzes
Pre/Post Test
Notebook
Competency List
Time Cards
Group Projects
Project based assessment
Worksheets
NIMS Level I CNC

Resources/Equipment:

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

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Distributed Numerical Control (DNC)
The Cartesian Coordinate System
Axes of Machine Movements
NC Positioning Methods
Contour or Continuous Path Machining
Mirror Image Machining
Test Your Knowledge Questions
CNC Machining Centers
Safety Glasses
Shop Coat
Work Shoes
Fire extinguisher
MSDS Sheets
Ear Plugs
Machinable wax

Monroe Career & Technical Institute
Course Name: Computerized Machine Tool Technology

Unit Name: L1500 SHOP MATH
Unit Number: L1500

Dates: Spring 2013 **Hours:** 30.00

Unit Description / Objectives:

Student will know and be able to understand English and metric (SI) measurement systems and perform conversion between the two, demonstrate understanding of fractional and decimal math and conversions between fractions and decimals, demonstrate ability to solve formulas and equations using basic algebra.

Student will also know and be able to identify and use properties of basic geometry system, demonstrate understanding of angular relationships, perform addition and subtraction of angular measurement, demonstrate ability to locate and identify points on the Cartesian coordinate system, demonstrate ability to use the Pythagorean Theorem, and demonstrate the ability to solve right triangles using sine, cosine, and tangent functions.

Tasks:

L1501 - Perform mathematical operations with fractions.

L1502 - Formulate metric conversions.

L1503 - Calculate speeds and feeds.

L1504 - Calculate angles and dimensions using right angle trigonometry.

L1505 - Calculate indexing patterns.

L1506 - Apply fundamentals of geometry.

L1507 - Calculate tapers using degrees, TPI, & TPF.

L1508 - Plot points using a coordinate system.

Standards / Assessment Anchors

Supporting Standards/Anchors

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.

3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.

3.4.12.A3 Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

3.4.12.C2 Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

3.4.12.D2 Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Supporting Standards/Anchors

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

CC.2.1.CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.

CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.
HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
CC.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context.
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials.
CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.
CC.2.2.HS.D.5 Use polynomial identities to solve problems.
CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.
CC.2.2.HS.C.5 Construct and compare linear, quadratic and exponential models to solve problems.
CC.2.2.HS.C.6 Interpret functions in terms of the situation they model.
CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions.
CC.2.2.HS.C.8 Choose trigonometric functions to model periodic phenomena and describe the properties of the graphs.
CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.
CC.2.3.HS.A.1 Use geometric figures and their properties to represent transformations in the plane.
CC.2.3.HS.A.2 Apply rigid transformations to determine and explain congruence.
CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
CC.2.3.HS.A.4 Apply the concept of congruence to create geometric constructions.
CC.2.3.HS.A.5 Create justifications based on transformations to establish similarity of plane figures.
CC.2.3.HS.A.6 Verify and apply theorems involving similarity as they relate to plane figures.
CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
CC.2.3.HS.A.8 Apply geometric theorems to verify properties of circles.
CC.2.3.HS.A.9 Extend the concept of similarity to determine arc lengths and areas of sectors of circles.
CC.2.3.HS.A.10 Translate between the geometric description and the equation for a conic section.
CC.2.3.HS.A.11 Apply coordinate geometry to prove simple geometric theorems algebraically.
CC.2.3.HS.A.12 Explain volume formulas and use them to solve problems.
CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
CC.2.3.HS.A.14 Apply geometric concepts to model and solve real world problems.

Connecting Standard/Anchor

- CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Supporting Standards/Anchors

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.
CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.
CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
CC.2.1.7.D.1Analyze proportional relationships and use them to model and solve real-world

and mathematical problems.
CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.
CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.
CC.2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.

Instructional Activities:

Knowledge:
Perform mathematical operations with fractions
Formulate metric conversions
Calculate speeds and feeds
Calculate angles and dimensions using right angle trigonometry
Calculate indexing patterns
Apply fundamentals of geometry
Calculate tapers using degrees, TPI, & TPF
Plot points using a coordinate system

Skill:
Perform mathematical operations with fractions
Formulate metric conversions
Calculate speeds and feeds
Calculate angles and dimensions using right angle trigonometry
Calculate indexing patterns
Apply fundamentals of geometry
Calculate tapers using degrees, TPI, & TPF
Plot points using a coordinate system

Remediation:
Re-teach major concepts
Review with teacher assistance
Study group
Worksheets
Individual tutoring
Group tutoring
Peer tutoring
Study groups
Review games
Retest or alternative assessment
Technology integration
Study guides
Computer assisted instruction
Checklists

Enrichment:
Upon completion students will move to the next task/assignment
Repeat tasks to enhance skill

Safety:
Student must:
Wear safety glasses, work shoes, and shop coat
Remove all jewelry
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed area
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools

Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Quizzes
Pre/Post Test
Notebook
Competency List
Time Cards
Group Projects

Resources/Equipment:

Hoffman, P.J., Hopewell, E.S., Janes, B., Sharp Jr., K.M. (2012). Precision Machining Technology. Delmar Cengage Learning. Clifton Park, NY.

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