

WARREN COUNTY SCHOOL DISTRICT

Planned Instruction

Course Title: Machine Technology

Course Number: 00907(AM) – 00957 (PM)

Suggested Educational Level: Grades 10-12

Suggested Periods Per Week: 15/wk. **Length of Period:** 42 mins.

Suggested Length Of Course: 3 Years

Units Of Credit (If Appropriate): 3 Per Year

Date Written: March 8, 2005 **Date Approved:** May 9, 2005

Date Reviewed: Spring 2005 **Implementation Year:** 2005-2006

Teacher Certification Required: Vocational--Machine Technology

Standards Addressed (code):

Career, Education, and Work: 13.1.11 A, C, D; 13.2.11 A, B, E, F,G

Science and Technology: 3.4.10 C; 3.7.10 A, B, C; 3.7.12 A, B;

Mathematics: 2.1. 8 D, G; 2.2.11C, E; 2.3.11 A, B, C; 2.5.11 C; 2.9.11 F; 2.9.8 E

Reading, Writing, Listening, Speaking: 1.1.11 A; 1.6.11 A

National Institute Machine Standards

Relationship to Other Planned Instruction: Blueprints from Drafting/CAD are often used. Small Engine and Autobody occasionally rely upon Machine Technology for making parts.

Prerequisites: Students should have a proficient background in math and above average aptitudes in spatial relations, mechanical and numerical ability, and motor coordination/finger dexterity.

Special Requirements: Students must successfully complete and follow all safety instruction and expectations of this course.

Writing Team Members: Clayton Webber, Mark Lindberg

Standards addressed :

Career, Education and Work

13.1.11A

Analyze career options based on student interest, ability, aptitude, and accomplishments.

13.1.11C

Evaluate opportunities for career preparation.

- Cooperative education
- Internship
- Job shadowing
- Part-time employment
- Registered apprenticeship
- School-based enterprise
- Volunteerism

13.1.11D

Justify the selection of a career.

13.2.11A

Know and demonstrate industry acceptable job interviewing techniques.

13.2.11B

Analyze and evaluate complex technical tasks using sophisticated processes.

- Equipment
- Facilities
- Materials
- Techniques
- Technology
- Tools

13.2.11E

Evaluate prepared career acquisition documents based upon industry acceptable practices.

- Accuracy
- Completeness
- Neatness
- Qualifications

13.2.11F

- Analyze performance-based assessments components.
- Portfolio review
- Nationally validated assessment
- Local/state/national skill certificate

13.2.11G

Analyze the need for manipulative/motor skills.

- Cooperative education
- Internship
- Job shadowing
- Part-time employment
- Registered apprenticeship
- School-based enterprise
- Tech-Prep
- Vocational program completion
- Volunteerism

Science and Technology

3.4.10C

Distinguish among the principles of force and motion.

- Identify the relationship of electricity and magnetism as two aspects of a single electromagnetic force.
- Identify elements of simple machines in compound machines.
- Explain fluid power systems through the design and construction of appropriate models.
- Describe sound effects (e.g., Doppler effect, amplitude, frequency, reflection, refraction, absorption, sonar, seismic).

3.7.10A

Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.

- Select and safely apply appropriate tools, materials, and processes necessary to solve complex problems.
- Apply advanced tool and equipment manipulation techniques to solve problems.

3.7.10B

Apply appropriate instruments and apparatus to examine a variety of objects and processes.

- Describe and use appropriate instruments to gather and analyze data.
- Compare and contrast different scientific measurement systems; select the best measurement system for a specific situation.
- Explain the need to estimate measurements within error of various instruments.
- Apply accurate measurement knowledge to solve everyday problems.
- Describe and demonstrate the operation and use of advanced instrumentation in evaluating material and chemical properties (e.g., scanning electron microscope, nuclear magnetic resonance machines).

3.7.10C

Apply basic computer operations and concepts.

- Identify solutions to basic hardware and software problems.
- Apply knowledge of advanced input devices.
- Apply knowledge of hardware setup.
- Describe the process for basic software installation and demonstrate it.
- Analyze and solve basic operating systems problems.
- Apply touch keyboarding skills and techniques at expectable speed and accuracy.
- Demonstrate the ability to perform basic software installation.

3.7.12A

Apply advanced tools, materials, and techniques to answer complex questions.

- Demonstrate the safe use of complex tools and machines within their specifications.
- Select and safely apply appropriate tools, materials, and processes necessary to solve complex problems that could result in more than one solution.
- Evaluate and use technological resources to solve complex multistep problems.

3.7.12B

Evaluate appropriate instruments and apparatus to accurately measure materials and processes.

- Apply and evaluate the use of appropriate instruments to accurately measure scientific and technologic phenomena within the error limits of the equipment.
- Evaluate the appropriate use of different measurement scales (macro and micro).
- Evaluate the utility and advantages of a variety of absolute and relative measurement scales for their appropriate application.

Mathematics

2.1.8D

Apply ratio and proportion to mathematical problem situations involving distance, rate, time, and similar triangles.

2.1.8G

Use the inverse relationships between addition, subtraction, multiplication, division, exponentiation, and root extraction to determine unknown quantities in equations.

2.2.11C

Construct and apply mathematical models, including lines and curves of best fit, to estimate values of related quantities.

2.2.11E

Recognize that the degree of precision needed in calculating a number depends on how the results will be used and the instruments used to generate the measure.

2.3.11A

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

2.3.11B

Measure and compare angles in degrees and radians.

2.3.11C

Demonstrate the ability to produce measures with specified levels of precision.

2.5.11C

Present mathematical procedures and results clearly, systematically, succinctly, and correctly.

2.9.8E

Construct parallel lines, draw a transversal, and measure and compare angles formed (e.g., alternate interior and exterior angles).

2.9.11F

Use the properties of angles, arcs, chords, tangents, and secants to solve problems involving circles.

Reading, Writing, Listening, Speaking

1.1.11A

Locate various texts, media, and traditional resources for assigned and independent projects before reading.

1.6.11A

Listen to others.

- Ask clarifying questions.
- Synthesize information, ideas, and opinions to determine relevancy.
- Take notes.

COURSE DESCRIPTION:

Students enrolled in Machine Technology will become familiar with classroom and laboratory experiences concerning all aspects of shaping metal parts. Emphasis will be placed on bench work and operating lathes, power saws, milling machines, grinders, drill presses, welders, and the electrical discharge machine. Students will also learn to use layout tools, micrometers, and gauges. Blueprint reading and layout of machine parts will also be taught. Computer numerically controlled machines, programming, and maintenance are also learned in the Machine Technology program.

Applied math and science are a vital part of the Machine Technology program. Graduates from the Machine Technology program are prepared to enroll in tech prep associate degree programs such as plastic and polymer technology, tool-making technology, biomedical equipment technology, and manufacturing engineering technology. Students may qualify for advanced placement at institutions such as Penn College of Technology in Williamsport, PA.

All course content and instruction are aligned to National Institute Machine Standards (NIMS). NIMS certificates may be earned by successful students.

Professional attitudes will be developed through the Skills USA Club and class activities.

Outline of Content Sequence and Recommended Time:

The course outline below is aligned to the National Institute Machine Standards.

- I. Level 1—Metal-forming and Layout (14 days)
 - A. Safety
 - B. Use of height gage and micrometer reading
 - C. Blueprint reading
 - D. Use or layout tooling, ID, OD precision measurement instruments
- II. Level 1—Power Feed Milling (38 days)
 - A. Safety
 - B. Tooling
 - C. Blueprint
 - D. Speeds and Feeds
 - E. Use of precision measuring instruments
 - F. Proper use of machine
- III. Level 1—Turning Between Centers (40 days)
 - A. Safety
 - B. Tooling
 - C. Blueprint
 - D. Speeds and Feeds
 - E. Use of precision measuring instruments
 - F. Proper use of machine
- IV. Level 1—Turning and Chucking (60 days)
 - A. Safety
 - B. Tooling
 - C. Blueprint
 - D. Speeds and Feeds
 - E. Precision measuring instruments
 - F. Proper use of machine
 - G. Internal cutting and threading
- V. Level 1—Surface Grinding (55 days)
 - A. Safety
 - B. Tooling
 - C. Blueprint
 - D. Feeds and depth of cuts

- E. Use of precision measuring instruments
- F. Milling process
- G. Types of grinding wheels and usage
- H. Proper use of machine
- VI. Level 1—Drilling (33 days)
 - A. Safety
 - B. Tooling
 - C. Blueprint
 - D. Feeds and speed
 - E. Use of precision measuring instruments
 - F. Proper use of drill press
 - G. Selecting proper holding techniques
- VII. Level 1—Vertical Milling (55 days)
 - A. Safety
 - B. Tooling
 - C. Blueprints
 - D. Feeds and speeds
 - E. Use of precision measuring instruments
 - F. Proper use of mill
 - G. Boring head attachments
 - H. Reaming
- VIII. CNC Programming (65 days)
 - A. Safety
 - B. Tooling
 - C. Blueprint
 - D. Feeds and speeds
 - E. G code X-Y-Z I-J-M codes
- IX. EDM—Electro-discharge Machine (65 days)
 - A. Safety
 - B. Identify major parts
 - C. Perform maintenance using machine manual
 - D. Tooling
 - E. Blueprint
 - F. Proper use of amperes and voltage
 - G. Choosing correct electrode
- X. Maintenance—(Millright) (60 days)
 - A. Safety
 - B. Identify major parts
 - C. Perform maintenance using manuals and prints
 - D. Welding-TIG, MIG, SMAW, Oxyfuel cutting
 - E. Blueprint
 - F. Knowledge of all machines in shop
 - G. Proper use of precision measuring tools
- XI. Performing Heat Treatment Tasks, Metallurgical Process (55 days)
 - A. Safety
 - B. Anneal work-piece
 - C. Harden work-piece
 - D. Stress draw work-piece

- XII. Skill USA (540 days)
- A. Safety
 - B. Sportsmanship

Specific Educational Objectives to be Taught:

The student successfully completing machine technology will be able to—

1. safely operate and demonstrate proper use of all the above-named processes.
2. use safety procedures for all shop equipment.
3. set up and demonstrate use of tooling.
4. demonstrate the use of blueprint reading skills.
5. explain how auxiliary views can clarify a drawing.
6. sketch a complex machined part showing auxiliary views.
7. demonstrate the use of speeds and feeds using the machinist handbook.
8. demonstrate proper use and care of measuring instruments.
9. operate all machines properly.
10. identify proper grinding wheels and conduct a ring test on a grinding wheel.
11. demonstrate a program in G code for CNC machines.
12. demonstrate proper use of amperage and voltage and to choose the correct electrode for E.D.M.

Formative Assessments : Written quizzes and tests. Teacher observation of student progress.

Summative Assessments: Students are evaluated using NIMS checklists for every completed project.

Required/Approved Textbooks and Materials:

Book Title: Technology of Machine Tools
Publisher: Glencoe
ISBN #: 0-02-803071-0
Copyright: 1997
Date of Adoption:

Materials required: safety videos and CD's, safety posters, safety rules, machinist handbook (25th edition), tooling books and magazines, blueprint books, NIMS books and handouts are needed in addition to the metal materials and supplies to perform instruction.

Safety Unit:

At the beginning of each school year, students receive safety instruction regarding all aspects of shop safety. With the use of DVD's from Indiana University of Pennsylvania, students learn the proper use of each piece of machinery within the shop.

Quizzes and tests are given to assess student awareness of safety factors for each machine. Students must score 100% in each machine related assessment before receiving permission to use a machine.