

**WARREN COUNTY SCHOOL DISTRICT**

PLANNED INSTRUCTION

**COURSE DESCRIPTION**

**Course Title:** Machine Technology

**Course Number:** 00907 (AM) & 00957 (PM)

**Course Prerequisites:** A student must have earned at least six (6) credits as a sophomore and/or twelve (12) credits as a junior to be enrolled in Machine Technology

**Course Description: 48.0501 Machine Technology/Machinist**

Students enrolled in Machine Technology will become familiar with all aspects of shaping metal parts through classroom and laboratory experiences. Emphasis will be placed on bench work, operating lathes, power saws, milling machines, grinders, drill presses and EDM. Students will also learn to use layout tools, micrometers, and gauges. Blueprint reading and layout of machine parts will also be taught. Instruction in Computer Numerical Control (CNC) machines, programming and maintenance will be provided in Machine Technology.

Applied math and science are a vital part of the program. A final exam is required for the course. 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 post-secondary institutions.

All course content and instruction are aligned to the NIMS (National Institute of Metalworking Skills). NIMS Industry Certifications can be earned by students. Professional attitudes will be developed through the SkillsUSA CTSO and activities.

**Suggested Grade Level:** Grades 10-12

**Length of Course:** Two Semesters

**Units of Credit:** 3

**PDE Certification and Staffing Policies and Guidelines (CSPG) Required Teacher Certifications:**

Code: 2043 Machine Technology

To find the CSPG information, go to [CSPG](#)

**Certification verified by the WCSD Human Resources Department:**  Yes  No

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**WCSD STUDENT DATA SYSTEM INFORMATION**

**Course Level:** Academic

**Mark Types:** Check all that apply.

F – Final Average     MP – Marking Period     EXM – Final Exam

**GPA Type:**

GPAEL-GPA Elementary     GPAML-GPA for Middle Level     NHS-National Honor Society  
 UGPA-Non-Weighted Grade Point Average     GPA-Weighted Grade Point Average

**State Course Code:** 13203

To find the State Course Code, go to [State Course Code](#), download the Excel file for SCED, click on SCED 6.0 tab, and chose the correct code that corresponds with the course.

**TEXTBOOKS AND SUPPLEMENTAL MATERIALS**

**Board Approved Textbooks, Software, and Materials:**

**Title:** Precision Machining Technology – 3<sup>rd</sup> Edition

**Publisher:** Skills

**ISBN #:** 9780357395127

**Copyright Date:** 2020

**WCSD Board Approval Date:** 9/14/2020

**Title:** Reading for Machinists – 6<sup>th</sup> Edition

**Publisher:** Skills

**ISBN #:** 9781337810678

**Copyright Date:** 2019

**WCSD Board Approval Date:** 9/14/2020

**Supplemental Materials:** Student Workbook and Project Manual for Precision Machining 3<sup>rd</sup> edition – ISBN #: 97813377955319

**Curriculum Document**

**WCSD Board Approval:**

**Date Finalized:** 7/31/2020

**Date Approved:** 9/14/2020

**Implementation Year:** 2020-2021

**SPECIAL EDUCATION, 504, and GIFTED REQUIREMENTS**

The teacher shall make appropriate modifications to instruction and assessment based on a student’s Individual Education Plan (IEP), Chapter 15 Section 504 Plan (504), and/or Gifted Individual Education Plan (GIEP).

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**For standards, essential questions, content, and skills see Curriculum Map – See Task Grid**

**PA Academic Standards:** Aligned with PA Standards

**PA Standard**

Career Education and Work: 13.1.11. A,B,C,F; 13.2.11. C; 13.3.11; 13.4.11  
Science and Technology: 3.1.10; 3.2.10 A,B,D; 3.3.10; 3.4.10 A,B,C; 3.5.10; 3.6.10 B,C;  
3.7.10 A,B,C,D,E; 3.8.10; 3.9.10  
Math: 2.1.11 A; 2.2.11 A,B,C,D,E,F; 2.3.11 A,B,C; 2.4.11; 2.6.11 A,D,H,I; 2.7.11 B;  
2.8.11 A,O; 2.9.11A,D,F; 2.10.11 B.  
Reading, Writing, Speaking, and Listening: 1.1.11 A,C,D,E,F,G,H; 1.2.11 A,B; 1.3.11;  
1.4.11; 1.5.11 A,B,C,D,E,F; 1.6.11 A,B,C,D,E,F; 1.7.11; 1.8.11 A,B,C

**Industry or Other Standards:** National Institute of Metalworking Skills (NIMS)

Students can earn a NIMS skills credential in Machining Level I in nine (9) areas. The national industry certification is earned by machining parts to specification and passing a written test. The nine (9) areas that students can credential in are:

- Bench work
- Layout
- Turning Between Centers
- Vertical Milling
- Surface Grinding
- Drill Press
- CNC Turning
- CNC Milling

## **SCOPE AND SEQUENCE OF CONTENT, CONCEPTS, AND SKILLS**

### **Competency Task List**

#### **I. Safety (130 hours)**

- A. Identify safety procedures.
- B. Explain general safety precautions.
- C. Identify and explain personal/laboratory safety requirements.
- D. Identify location of MSDS.

#### **II. Performance Precision Measurement (50 hours)**

- A. Care for precision instruments
- B. Measure work on a surface plate.
- C. Check work with an optical comparator.
- D. Check work with plug & ring gages.
- E. Check work with radius gages.
- F. Check work with a sine bar.
- G. Layout work with combination square.
- H. Measure work with depth gages.

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- I. Measure work with depth micrometer.
- J. Measure work with dial calipers.
- K. Measure work with gage blocks.
- L. Measure work with height gages.
- M. Measure work with indicators.
- N. Measure work with inside micrometer.
- O. Measure work with outside micrometer.
- P. Measure work with telescope and hole gages.

**III. Benchwork (90 hours)**

- A. Identify and use basic & precision layout tools.
- B. Demonstrate bench work safety procedures.
- C. Cut material with a hand hacksaw.
- D. File work to specifications.
- E. Cut threads with hand taps and dies.
- F. Assemble and disassemble parts.
- G. Identify and use bench hand tools.
- H. Identify & use a hand arbor and/or hydraulic press.

**IV. DRILL PRESSES (130 hours)**

- A. Clean and lubricate drill press.
- B. Counter-bore hole to specifications.
- C. Countersink hole to specifications.
- D. Drill hole to size.
- E. Drill hole with automatic feed.
- F. Drill work-piece with fixtures.
- G. Lap hole to size.
- H. Mount work on V-blocks.
- I. Ream hole to size.
- J. Sharpen drill free hand.
- K. Sharpen drill with grinding attachment.
- L. Pot-face to specified dimension.
- M. Tap hole by hand on drill press.
- N. Tap hole with tapping attachment.

**V. OPERATE GRINDING MACHINES (95 hours)**

- A. Identify and demonstrate pedestal grinding safety procedures.
- B. Identify parts of pedestal grinder.
- C. Demonstrate the proper way to test, mount and dress grinding wheels.
- D. Grind various single point lathe face and turning tools.
- E. Grind and use flat bottom drills. 6. Sharpen various size twist drills.
- F. Grind 60 degree external and internal threading tools.
- G. Grind single point radius and parting tool setters.
- H. Identify & demonstrate surface grinding safety procedures.
- I. Identify parts of surface grinder.

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- J. Grind surfaces flat & parallel using a magnetic chuck.
- K. Grind work surfaces square with a vise or angle plate.
- L. Grind precision angles using a sine plate or sine bar.

**VI. OPERATING LATHES (175 hours)**

- A. Identify and demonstrate lathe safety procedures.
- B. Mount and true work piece in 3-jaw and 4-jaw chucks.
- C. Align centers.
- D. Face work piece.
- E. Turn outside diameters.
- F. Turn inside and outside diameters to shoulders.
- G. Turn tapers.
- H. Demonstrate knurling.
- I. Part off & groove work piece.
- J. Chase external threads.
- K. Chase internal threads.
- L. Demonstrate gun tapping.
- M. Demonstrate filing & polishing.
- N. Demonstrate die thread cutting.
- O. Demonstrate boring.
- P. Select & demonstrate use of various tool holders.
- Q. Demonstrate use of a steady rest and/or follower rest.
- R. Demonstrate use of collet attachment.

**VI. MILLING MACHINES (140 hours)**

- A. Identify & demonstrate milling machine safety procedures.
- B. Demonstrate tramming of head.
- C. Select, mount & indicate vise.
- D. Machine angles.
- E. Machine keyways.
- F. Demonstrate fly cutter operations.
- G. Demonstrate indexing head calculations & use.
- H. Demonstrate use of digital readout.
- I. Demonstrate use of edge finder.
- J. Demonstrate climb and conventional milling.
- K. Demonstrate gun tapping.
- L. Demonstrate use of adjustable boring head.
- M. Calculate speeds and feeds.

**VII. POWER SAW (30 hours)**

- A. Identify & demonstrate power saw safety procedures.
- B. Demonstrate cutting and welding saw blades.
- C. Remove and replace saw blades.
- D. Demonstrate accurate sawing to a scribed line.
- E. Select and set speeds for saw operations.

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- VIII. **METALLURGY (25 hours)**
  - A. Identify & explain metals classifications.
  - B. Identify & explain metal property applications.
  - C. Identify & explain heat-treating processes.
  
- IX. **USE OF CHARTS AND REFERENCES (25 Hours)**
  - A. Use the decimal equivalent chart.
  - B. Use speed and feed charts.
  - C. Utilize thread charts.
  - D. Demonstrate use of the Machinery's Handbook.
  
- X. **BLUEPRINT READING (50 hours)**
  - A. Identify & explain views and projections.
  - B. Demonstrate basic sketching and dimensioning.
  - C. Identify & explain lines, dimensions, tolerances and fits.
  - D. Calculate material sizes based upon job needs.
  - E. Identify & interpret geometric dimensioning and tolerance.
  
- XI. **CNC PROGRAMMING (140 hours)**
  - A. Demonstrate CNC safety procedures.
  - B. Demonstrate basic use of G & M codes.
  - C. Demonstrate use of numerical controls.
  - D. Identify & demonstrate use of Cartesian & polar coordinate systems.
  - E. Demonstrate absolute & incremental positional.
  - F. Demonstrate dry run of program.
  - G. Identify & explain advantages & disadvantages of CNC machining.
  - H. Calculate & apply machine feeds and speeds.
  - I. Set part zero and tool offsets.
  - J. Post & transfer files to and from a CNC machine.
  - K. Identify and demonstrate use of MDI applications.

**COOP**

Varied

@ 36 weeks

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**ASSESSMENTS**

**PSSA Academic Standards, Assessment Anchors, and Eligible Content:** The teacher must be knowledgeable of the PDE Academic Standards, Assessment Anchors, and Eligible Content and incorporate them regularly into planned instruction.

**Formative Assessments:** The teacher will utilize a variety of assessment methods to conduct in-process evaluations of student learning.

**Effective formative assessments for this course include:** [Click or tap here to enter text.](#)

**Summative Assessments:** The teacher will utilize a variety of assessment methods to evaluate student learning at the end of an instructional task, lesson, and/or unit.

**Effective summative assessments for this course include:** [Click or tap here to enter text.](#)