Performance Standards
MACH 151 and MACH 151L

1) Demonstrate proficiency in maintaining work area and working in a safe manner.
   a. Dispose of scrap and waste.
   b. Clean and maintain work areas and machinery.
   c. Leave area in safe condition
   d. Comply with shop-safety rules
   e. Use the correct safety supplies when needed.
   f. Understand the OSHA requirements for posting MSDS's.
   g. Demonstrate proper handling of hazardous waste.
   h. Know procedure for machining flammable metals.

2) Perform mathematical calculations.
   a. Make job related decimal and fractional calculations.
   b. Solve problems using addition, subtraction, multiplication, and division.
   c. Demonstrate proficiency in using hand held calculator.
   d. Solve problems using formulas.
   e. Solve problems using geometry.
   f. Solve problems using *Machinery's Handbook,* tables and handouts.
   g. Convert inch to metric and *vice versa*.
   h. Use Trigonometry to solve shop related calculations.
   i. Correctly calculate speeds and feeds for all of the common shop equipment.
   j. Correctly measure threads using wires and triangles to specified class of fit.
   k. Calculate ratios and proportions.
   l. Correctly set up angles and tapers on mills and lathes.
   m. Convert DMS angles to decimal equivalents.

3) Correctly perform measuring operations.
   a. Read and measure using rules and calipers.
   b. Read and measure using dial, digital and vernier calipers.
   c. Read and measure using various micrometer calipers.
   d. Read and measure using dial indicators.
   e. Read and measure using gage blocks.
   f. Set up and use Sine Bar for precision measurement.
   g. Through North Idaho College:
      i. Set up and use Profilometer
      ii. Set up and use Optical Comparator.
      iii. Set up and use Rockwell Hardness Tester
   h. Complete mechanical inspection.

4) Perform maintenance on machine tools.
   a. Lubricate equipment according to manufacturers specifications.
   b. Clean and store hand tools, cutters, fixtures, jigs, and accessories.
   c. Inspect and maintain hand tools.
   d. Inspect drive belts and pulleys.
   e. Select proper lubricants for the application.
   f. Inspect work areas for safety.

5) Demonstrate Professionalism
   a. Demonstrate professionalism by securing required tools in a timely manner.
   b. Demonstrate professionalism by acting in a manner that will reflect well on the class and institution.

6) Bench working skills
   a. Cut materials using hacksaw.
   b. Cut threads using hand-held dies.
   c. Hand sharpen tool bits, using both carbide and HSS.
   d. Use hand held honing stone.
   e. Set up and use arbor presses (hydraulic and mechanical).
   f. Correctly deburr parts **priority**
   g. Broach internal keyway.

7) Set up and operate power saws.
   a. Remove and replace bandsaw blades.
   b. Correctly weld bandsaw blades
   c. Remove and replace abrasive saw blades.
   d. Select appropriate blades for application.
   e. Set correct speeds on saw.
   f. Cut various materials to correct length.
   g. Cut various materials to correct angles using saws.
   h. Through North Idaho College:
      i. Set up and operate cold saw.
      ii. Set up and operate chop saw.

8) Set up and operate pedestal grinders.
   a. Set up guards and support rests.
   b. Remove, inspect and install wheels.
   c. Dress wheels using manual wheel dressers.
   d. Grind lather tools to correct angles.
   e. Hand sharpen drill bits.
   f. Correctly use polishing and deburring wheels on pedestal machines.

9) Set up and operate drill press.
   a. Select correct work holding strategies.
   b. Correctly perform hole work, including drill, ream, c'bore, c'sink, center drill and tap.
   c. Correctly set speeds and feeds.

10) Set up and operate engine lathes.
   a. Identify parts of machine and their function.
   b. Measure stock.
   c. Secure tools, tool holders, fixtures and accessories.
   d. Select correct feeds and speeds for the materials being machined.
   e. Set up, turn, face and bore workpiece using 3-jaw chuck.
   f. Set up, turn, face and bore using 4-jaw chuck.
   g. Perform filing on lathe to deburr parts.
   h. Align lather centers using appropriate methods.
   i. Drill, ream, countersink, tap and counter bore using lathe.
   j. Die cut threads using lathe.
   k. Single point threads to industry specifications (class of fit).
   l. Bore holes using lather.
   m. Form knurls, using various knurling tools.
   n. Cut internal threads.
   o. Perform contour, angular and radius cuts using lathe.
   p. Set up and use steady and follow rests.
   q. Set up and use large faceplate.
   r. Set up and use small faceplate and drive dogs (turn between centers).
   s. Set up and operate various collet closers.

11) Set up and operate milling machines.
   a. Identify parts and functions of milling machines.
   b. Indicate head on universal head mills.
   c. Indicate mill vise, rotary tables, indexers, and other accessories.
   d. Perform milling cuts using end mills, face mills, fly cutters.
   e. Perform drilling, reaming, c'sinking, c'boring, boring manually and under power feed.
   f. Mill various angles, using sine bar, sine plate and rotary base on vise.
   g. Cut external key ways, using end mills, wheel cutters.
   h. Set up and operate various mill attachments, like right angle head and shaping head.
   i. Mill internal slots.
   j. Correctly use edge finder.
   k. Efficiently use DRO.

12) Through North Idaho College:
    a. Identify and select machine controls.
    b. Perform basic heat-treating processes.
        i. Air harden tool steels.
        ii. Oil harden tool steels.
        iii. Water harden tool steels.
        iv. Temper
    c. Perform case hardening.
        i. Carburizing.
        ii. Kasenite
    d. Select correct processes for the various metals encountered.

13) Demonstrate appropriate communication skills.
    a. Write logical and understandable sentences.
    b. Read and understand graphs, charts, diagrams and tables associated with the trade.
    c. Read and follow written instructions.
    d. Follow oral instructions.
    e. Read critically, recognize assumptions and implications by evaluating ideas.
    f. Demonstrate appropriate telephone communications skills.

14) Demonstrate appropriate understanding of basic science.
    a. Understand molecular level changes as the result of temperature.
    b. Draw conclusions or make inferences based on data.
    c. Understand correct trouble-shooting strategies associated with the trade.
    d. Demonstrate an understanding of the scientific method.
    e. Understand basic chemistry – metals, non-metals, alloys, elements.

15) Demonstrate employability skills.
    a. Demonstrate appropriate responses to criticism from employers, supervisors and peers.
    b. Demonstrate appropriate work habits.
    c. Demonstrate professionalism by having current resume.

16) Demonstrate an understanding of entrepreneurship.
    a. Define it.
    b. Demonstrate and understanding of entrepreneurship and its relationship to our economy and competitive position.
    c. Demonstrate an understanding of how business in our economy is conducted.
    d. Demonstrate an understanding and appreciation of ethical business practices.

17) Demonstrate an understanding of carbide, PCD, CBN tooling and its uses.
    a. Understand various grades and uses.
    b. Understand the chemistry associated with carbides.
    c. Understand the geometry and nomenclature of brazed carbides.
    d. Understand the geometry and nomenclature of indexable carbides.
    e. Know failure modes and trouble-shooting.
    f. Know the various coatings and their uses.
    g. Understand and be able to prescribe various geometrics and coatings for specific applications.
    h. Understand the mechanics of turning and milling.
        i. Axial force.
        ii. Radial force.
        iii. Chip breakers and geometries.
        iv. Molded relief inserts.

18) Grinder
    a. Remove and install wheels on surface, OD, and tool and cutter grinders.
    b. Select correct grade of wheel for application.

c. Correctly dress wheels.
d. Install and true up magnetic chucks.
e. Grind various tools steels (A-2), O-1, and D-2) after heat-treat to hold tolerances of +/- .0002.

19) Computer applications
a. Encourage participation in Tech Prep keyboarding and other Business applications.
b. Encourage introduction to BobCAD or AutoCAD software and the ability to access the software, open and close files, and shut down program.