EASTERN ARIZONA COLLEGE
Machine Tool Methods
Course Design
2015-2016

Course Information

Division	Industrial Technology Education
Course Number	MSP 201
Title	Machine Tool Methods
Credits	3
Developed by	Brian Coppola
Lecture/Lab Ratio	1 Lecture/6 Lab

Transfer Status

ASU	NAU	UA
Non Transferable	CTE Departmental Elective	Non Transferable

Activity Course	No
CIP Code	48.0500
Assessment Mode	Pre/Post Test (24 Questions/24 Points)
Semester Taught	Upon Request
GE Category	None
Separate Lab	Yes
Awareness Course	No
Intensive Writing Course	No

Prerequisites

None

Educational Value

This course will help students understand the level of technology that is required to do aerospace quality machining. Machine Shop majors will learn the satisfaction of doing a difficult job well, and they will gain skills that will give them confidence and employability.

Description

A study of industrial machine tool methods. Includes writing job sheets, estimating machining time, tool and cutter grinding, doing jig bore work, heat-treating, fabricating jigs and fixtures, use of all machines in the shop and final inspection.

Supplies

Supplies are furnished by the department

Competencies and Performance Standards

1. Operate all shop equipment and tools safely and effectively.

Learning objectives

What you will learn as you master the competency:

a. To identify the causes of accidents in a machine shop environment.

b. To list the safety equipment required in shop operations.

c. To list the safety rules for each machine tool and hand tool.

d. To identify conditions in a shop that would be considered hazardous.

Performance Standards

Competence will be demonstrated:

- by completing assigned projects
- by choosing correct tools for each task and using them correctly

Criteria - Performance will be satisfactory when:

- learner practices recognized safety procedures and uses the prescribed safety equipment
- learner demonstrates an ability and willingness to follow designated procedures

2. Prepare lathe spindle-mounted fixture for machining odd-shaped parts.

Learning objectives

What you will learn as you master the competency:

a. To choose stable materials for fixture construction.

b. To align central axis with part center.

c. To counter balance fixture for smooth operation.

d. To clamp part securely.

e. To provide clearance for cutting tools.

Performance Standards

Competence will be demonstrated:

- by completing assigned project
- by using cutting tools and machine tools in the machine shop

Criteria - Performance will be satisfactory when:

- learner fabricates a lathe fixture to specifications

3. Prepare a milling fixture for machining hard-to-hold castings.

Learning objectives

What you will learn as you master the competency:

a. To list the different methods of locating a casting in a fixture and show locating methods for four different kinds of casting locating devices.

b. To list the different ways a casting can be clamped in a fixture.

c. To describe four different kinds of mill fixtures.

Performance Standards

Competence will be demonstrated:

- in completing homework assignments

- in completing job sheets in the classroom
- in using the tools and equipment in the machine shop

Criteria - Performance will be satisfactory when:

- learner fabricates a milling fixture to specifications

4. Prepare a drill jig for clamping the part and locating drilled holes precisely.

Learning objectives

What you will learn as you master the competency:

a. To list steps in operating a boring head.

b. To define the parameters of tolerance and interference for installing a hardened drill bushing.

c. To calculate the tolerances for hole positions in a drill jig.

d. To use bolted and doweled construction for accurate and rigid structure.

Performance Standards

Competence will be demonstrated:

- by completing homework assignments
- by using the tools and machine tools in the machine shop

Criteria - Performance will be satisfactory when:

- learner completes a drill jig to specifications

5. Sharpen mill, drill, shaper and lathe cutters using shop cutter grinding equipment.

Learning objectives

What you will learn as you master the competency:

a. To define cutting tool geometry and list all cutting edge angles.

b. To describe the methods of producing clearance angles.

c. To demonstrate drill sharpening procedures by hand on a bench grinder and using a drill grinder.

d. To demonstrate the use of cutter grinders to sharpen milling cutters.

e. To prepare all types of lathe and shaper tools.

Performance Standards

Competence will be demonstrated:

- in completion of homework assignments
- in using the tools and grinders in the EAC machine shop

Criteria - Performance will be satisfactory when:

- learner diagrams the critical angles on a cutting tool
- learner sharpens the drills, end mills, and other cutters effectively

6. Accurately plan and perform the heat-treating processes of hardening, tempering, annealing, and carburizing.

Learning objectives

What you will learn as you master the competency:

a. To identify the procedures used to harden, temper and anneal.

b. To list the steps used to carburize a steel part.

c. To calculate the hardness of a part by using a Rockwell hardness tester.

d. To describe the internal changes that take place when a part is hardened.

e. To show the benefits and disadvantages of hardening.

f. To list the advantages of a part that has been hardened and ground.

Performance Standards

Competence will be demonstrated:

- in completing homework assignments
- in completing classroom assignments
- in using tools and heat-treating furnace in the machine shop

Criteria - Performance will be satisfactory when:

- learner diagrams cycles of critical phase transformations
- learner describes the effects of carbon content on harden ability
- learner demonstrates thorough hardening and tempering of a cutting tool
- learner anneals a hardened shaft
- learner case hardens a mild steel part

7. Calculate positions, prepare coordinate charts and use them with a jig bore set-up to produce accurate hole positions.

Learning objectives

What you will learn as you master the competency:

a. To list the advantage of single point boring.

b. To describe the precision and accuracy of jig bore tooling.

c. To prepare a hole coordinate chart from blueprint specifications.

d. To compare accuracy of drilling and reaming to drilling and bore machining.

e. To calculate the amount of interference required for installing hardened steel bushings and bearings.

f. To demonstrate the operation of the boring head.

Performance Standards

Competence will be demonstrated:

- by completing coordinate position charts in class
- in using milling and boring tools in the shop

Criteria - Performance will be satisfactory when:

- learner prepares a hole coordinate chart from blueprint specifications
- learner demonstrates the location of spindle at correct coordinate positions
- learner uses a boring head to prepare accurately located holes
- learner installs bushings and bearings correctly

8. Prepare machining time estimates.

Learning objectives

What you will learn as you master the competency:

a. To calculate machining time from speed and feed charts.

b. To calculate set-up times for a variety of jobs.

c. To estimate the inspection time for a variety of jobs.

d. To show how coordinate measuring machine processing can decrease inspection times.

e. To compare machining times for steels with different carbon content.

Performance Standards

Competence will be demonstrated:

- by estimating job times using speed and feed charts, machinery handbook and calculator

Criteria - Performance will be satisfactory when:

- learner accurately calculates job completion times

Types of Instruction

Classroom Presentation

Lab

Grading Information

Grading Rationale

30% of final grade is chapter tests

30% of final grade is project grades

30% of final grade is final exam

10% of final grade is attendance

Grading Scale

A	90% - 100%
B	80% - 89%
C	70% - 79%
D	60% - 69%
F	Below 60 %