

# STRANDS AND STANDARDS

## MACHINING 1



### Course Description

This course is the first in a sequence that will use technical knowledge and skills to plan and manufacture projects using machine lathes, mills, drill presses, and other equipment in safe working conditions to promote the manufacturing industries.

<b>Intended Grade Level</b>	10-12
Units of Credit	0.5
Core Code	40.10.00.00.072
Concurrent Enrollment Core Code	40.10.00.13.072
Prerequisite	N/A
Skill Certification Test Number	580
Test Weight	0.5
<b>License Area of Concentration</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Machine Tool
Endorsement 2	
Endorsement 3	

## STRAND 1

Student will participate in personal and leadership development activities through SkillsUSA or another appropriate career and technical student organization.

### Standard 1

Student will use communication skills to effectively communicate with others.

- Understand when it is appropriate to listen and to speak.
- Understand and follow verbal and written instructions for classroom and laboratory activities.

### Standard 2

Student will effectively use teamwork to respectfully work with others.

- Identify and understand different roles in working with a team

### Standard 3

Student will use critical thinking and problem-solving skills

- Analyze the cause of the problem.
- Develop a solution to address the problem.
- Implement the plan.
- Evaluate the effectiveness of the plan.

### Standard 4

Student will be dependable, reliable, steady, trustworthy, and consistent in performance and behavior.

- Set and meet goals on attendance and punctuality.
- Prioritize, plan, and manage work to complete assignments and projects on time.

### Standard 5

Student will be accountable for results.

- Use an achievement chart for activities and behaviors in class that encourages a personal evaluation of classroom performance.
- File a regular written report on progress toward completion of assignments and projects.

### Standard 6

Be familiar with the legal requirements and expectations of the course.

- Be familiar with the course disclosure statement and all requirements for successful completion of the course.
- Demonstrate workplace ethics, e.g. fair, honest, disciplined.

## STRAND 2

Student will participate in work-place readiness activities.

### Standard 1

Student will demonstrate employability skills.

- Use a career search network to find career choices.
- Write a resume including a list of demonstrated skills.
- Write a letter of application.
- Complete a job application.
- Participate in an actual or simulated job interview.

**Standard 2**

Student will participate in a work-based learning experience outside the classroom.

- Student will plan and implement a work-based learning experience aligned with their career goal.

**STRAND 3**

**Students will be able to understand safe practices and professional machine shop procedures.**

**Standard 1**

Follow safety manuals and all safety regulations and requirements.

**Standard 2**

Use PPE (personal protective equipment) and protective shields.

- Wear PPE as recommended by OSHA, UOSHA, and the Utah State Risk Management Office.
- Maintain and use appropriate protective guards and equipment on machinery.

**Standard 3**

Follow safe operating procedures for hand and power machine tools.

- Identify and understand safe machine operating procedures.
- Demonstrate safe machine operations at all times.

**Standard 4**

Maintain a clean and safe work environment.

- Keep work areas clean.
- Clean machine and hand tools when work is completed.
- Put tools away when work is finished.
- Keep aisles clear of equipment and materials.
- Perform preventive maintenance as required.
- Understand chemical hazards and the use of Material Safety Data Sheets (MSDS).
- Keep storage rooms well organized and free of clutter.

**Standard 5**

Each student should earn a score of 100% on a required safety exam relating to general shop safety and each machine tool he/she will be operating.

**STRAND 4**

**Students will be able to apply mathematical concepts.**

**Standard 1**

Perform basic arithmetic functions.

- Add, subtract, multiply, and divide whole numbers.
- Add, subtract, multiply, and divide fractions.
- Add, subtract, multiply, and divide decimals.

**Standard 2**

Convert fractions to decimal equivalents.

- Convert fractions to decimal equivalents.
- Convert decimal values to nearest fraction equivalent.
- Use Decimal Equivalent Chart for conversions.

**Standard 3**

Calculate speeds and feeds for machining.

- Given appropriate reference materials, calculate RPM for various metals and tools.

**Standard 4**

Locate basic machining points from a Datum Point.

- Identify points using the Cartesian coordinate system.
- Identify points using the absolute dimensioning system
- Identify points using the incremental dimensioning system

**STRAND 5**

**Students will be able to interpret engineering drawings and control documents.**

**Standard 1**

Identify basic layout of drawings.

- Identify types of lines within a drawing.

**Standard 2**

Identify basic types of drawings.

- Identify orthographic views.
- Identify positions of views (top, front, side, and auxiliary).
- Identify and describe the purpose of orthographic (three views) drawings.
- Identify and describe the purpose of isometric drawings.
- Identify and describe the purpose of exploded isometric drawings.
- Identify and describe the purpose of assembly drawings.
- Determine the scale of the view or section.
- Check for revisions and describe the current specifications.
- Recognize out-of-date blueprints and know appropriate related procedures.

**STRAND 6**

**Students will be able to properly perform measurement/inspection.**

**Standard 1**

Select proper measurement tools as they best relate to part characteristics and specified accuracy.

- Discuss how measurement tool selection can contribute to part accuracy/inaccuracy.
- Demonstrate proper manipulation and care of precision measuring tools.

**Standard 2**

Apply proper measuring techniques.

- Discuss factors affecting accurate measurement (dirt, temperature, improper measuring, tool calibration, etc.).
- Demonstrate how to check calibration of various precision instruments.

**Standard 3**

Accurately perform measurements with hand-held instruments.

- Read a tape measure to 1/16".
- Read a micrometer to .001".
- Read a steel rule.
- Read a dial/digital caliper to .001".

## STRAND 7

Students will be able to understand planning, hand tools, and recognize different manufacturing materials and processes.

### Standard 1

Prepare and plan for machining operations.

- Read and interpret blueprints.
- Plan machining operations, write a plan of procedure.

### Standard 2

Demonstrate proper use of hand tools.

- Select the most appropriate hand file and properly demonstrate its use.
- Correctly identify and use hand taps.
- Demonstrate the proper use of thread-cutting dies.
- Identify common hand tools and describe their basic applications.

### Standard 3

Identify common materials and explain basic properties.

- Discuss the classification systems for metals.
- Describe general characteristics for carbon steels, tool steels, stainless steels, structural steels, cast irons, aluminum, and other commonly used metals.

## STRAND 8

Students will be able to understand and demonstrate the use of grinding machines and band saws.

### Standard 1

Demonstrate proper use of grinding abrasive machines.

- Identify common types of grinding machines and discuss the major differences and applications.
- Discuss the variety and describe the proper selection and application of grinding fluids.
- Demonstrate the proper use and care of bench and pedestal grinders.

### Standard 2

Demonstrate proper use of band saws.

## STRAND 9

Students will be able to understand and demonstrate the use of milling machines.

### Standard 1

Demonstrate proper use of a vertical milling machine.

- Demonstrate the proper setup, operation, care, cleaning, and lubrication of the vertical milling machine.
- Correctly identify common cutters and explain their basic applications.
- Identify and demonstrate the proper use of all controls and adjustments on the vertical milling machine.
- Properly set up the milling machine and demonstrate the use of an edge finder. Locate a point within .001".
- Select the proper cutter and work holding device, demonstrate their proper installation and setup

to machine a part (This may include end mills, fly cutter, etc.).

- Having properly installed a drill chuck and an appropriate work holding device, demonstrate how to locate and drill a hole.
- Demonstrate the ability to use the Machinery Handbook as a reference for milling.

## STRAND 10

**Students will be able to understand and demonstrate the use of metal lathes.**

### Standard 1

Demonstrate proper use of metal lathes.

- Demonstrate the proper cleaning, lubrication, and care of the metal lathe.
- Identify common parts and demonstrate the proper use of basic controls and adjustments on the engine lathe.
- Identify and demonstrate the proper installation and application of standard tools and tool holders for the lathe.
- Identify common chucks and demonstrate proper procedure for changing and installing them.
- Demonstrate proper procedure for facing one end of a part.
- Demonstrate proper setup and procedure for center drilling parts.
- Demonstrate proper setup and procedure while drilling a hole.
- Demonstrate proper setup and technique for power tapping a through hole on a metal cutting lathe.
- Demonstrate proper setup and procedure for turning a part to diameter.
- Demonstrate proper setup and procedure for turning a 90 degree shoulder.
- Using the compound rest demonstrate the proper setup and procedure for turning a diameter and a taper.
- Demonstrate proper setup and procedure for turning between centers. (Optional)
- Demonstrate proper setup and procedure while single point cutting threads to standard pitch diameter and shape specifications.
- Demonstrate the proper procedure for grinding a HSS cutter bit.

### Performance Skills

- Use PPE – personal protective equipment.
- Maintain a clean and safe work environment.
- Each student should earn a score of 100% on a required safety exam relating to general shop safety and each machine tool he/she will be operating
- Perform basic arithmetic functions.
- Convert fractions to decimal equivalents.
- Calculate speeds and feeds for machining.
- Locate basic machining points from a Datum Point.
- Identify basic layout of drawings.
- Identify basic types of drawings.
- Select proper measurement tools as they best relate to part characteristics and specified accuracy.
- Apply proper measuring techniques.
- Accurately perform measurements with hand-held instruments.
- Demonstrate proper use of hand tools.
- Demonstrate proper use of grinding abrasive machines.
- Demonstrate proper use of band saws.

- Demonstrate proper use of a vertical milling machine.
- Demonstrate proper use of metal lathes.

### Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		