

COLLEGE OF AGRICULTURE AND APPLIED SCIENCES

Aviation and technical education

ASSESSMENT PLAN FOR:

Machine Tool Technology

FALL 2021

Machine Tool Technology Assessment Report

PROGRAM DESCRIPTION:

The Machine Tool Technology program at USU Eastern (Machining) is a two-semester per year, two-year course of study. The Certificate of Completion is awarded after all four semesters are completed with a minimum of 30 academic credit hours.

A program completer is known as a machinist. The program is open to a maximum number of students determined by shop space and equipment availability. Enrollment will be capped due to these constraints and reassessed at the beginning of each academic year.

The Machining program is taught by a master machinist. This individual has at least five years of experience in the machining field including formal education as well as on-the-job training to become proficient in the use of machines. Proficiency is to be determined through the hiring process at the discretion of the hiring committee.

A machinist is a skilled craftsperson who uses blueprints to set up and operate precision metal cutting and grinding machines. A completer of the machining program will be able to use the machining equipment to manufacture, install, operate, adjust, and repair machine tools and other commonly used equipment.

The program is designed to develop skills needed to safely and effectively operate various power equipment and precision measuring instruments related to the machining field. The following machines will be used regularly in the laboratory:

- Hand tools
- Grinders
- Drill press
- Saws
- Manual Lathes
- Manual Mills
- CNC Lathes
- CNC Mills

This is not a comprehensive list. The master machinist reserves the right to use additional tools necessary for educational projects and adjusting to the needs of the industry.

Students learn to read blueprints, setup and operate manual and

CNC machines, perform basic and advanced machining operations, and develop skills in decision-making to ensure that productivity and quality is obtained in a safe manner.

The program provides students with advanced machining skills, mainly manual and (Computer Numerical Control) (CNC) machines.

The courses required for certificate completion are categorized into three skill levels. The following list of skill areas show what is to be assessed at each level.

BASIC SKILLS

- Semi-precision and precision layout practices.
- Proficiency in basic machining hand tools
- Understanding tolerances
- Proficiency and precision in measuring instruments
- Reciprocating and band sawing
- Surface and bench grinding machines
- Understanding the structure and layout of machines
- Basic understanding of function and capabilities of each machine

INTERMEDIATE SKILLS

- Lathe operation: safety, tool bit grinding, tool holders, and lathe cutting
- Engine lathe care and maintenance
- Carbide tooling, speeds and feeds, and sixty-degree threading
- Turning operations, facing, center drilling, drilling-reaming, tapers, Boring - use of steady and follower rests, and coolants
- Drill press operation – safety, care and maintenance, speeds and feeds, drill theory, drill sharpening, countersinking, counter boring, reaming, threading, drilling layout, and coolants
- Milling machine operation – care and maintenance, safety, speeds and feeds
- Operation of vertical milling machines
- Center findings dial indicating tapers, angles, dialing in vices, bolt patterns keyway cutting, basic work holding fixtures, Identification of types of mill cutting

ADVANCED SKILLS

- Advanced skill of the machining process, quality control

metrology inspection, blueprint reading, and Computer Aided Manufacturing (CAM)
Understanding of G and M codes to proficiently produce, read, and edit code for the CNC machine tool
Learn 3 axis vertical mills and 2 axis turning operations.
Advanced fixturing proficiency - produce simple and intermediate parts.
Understanding production runs and to strive to run CNC efficiently as possible
Problem-solving abilities on the CNC – must be able to diagnose and know how to move forward with errors in the manufacturing process

Graduates will be able to apply and demonstrate the principles of CNC and Manual Machinist listed above following an open-ended apprenticeship mindset in the industry.

ASSESSMENT PROCEDURES

Each student will be given a pre-examination to test their baseline understanding of the machining process. This exam will include basic hand tool purposes and uses, shop safety, problem-solving assessments, etc. Students will be required to pass a safety exam before entering the shop and operating any tools or machines. A score of 100% is required to sufficiently pass the safety exam.

Students will be assessed throughout the term and in each course by their lab and theory work. They must demonstrate an understanding of the material and concepts before moving into the shop to perform the skills. A final lab project will be used to demonstrate a comprehensive understanding of skills required for each level of certification.

PROGRAM GOALS

1. Expand into an Applied Associate of Science (AAS) degree
2. Align structure with surrounding technical colleges
3. Maintain a competitive program distinguished by the career pathway system

By growing into an AAS degree, the Machining program can offer more competitive graduates when considering employment opportunities. It allows for additional education for students to receive a more well-rounded experience at the institution. More time is also given for students to be fully trained in their chosen career field. Doing so would align with surrounding colleges and universities making us more competitive on the academic front. Using the same credit hour totals and experiences increases the chance of recruitment and

retention of students.

While alignment of standards is beneficial, there is a need for determining what will set USU Eastern's program apart. As part of USU's mission as a whole to educate the larger population and increase academic achievement in the state, the Machining program will be recognized for its pathway program to additional degrees. Stackable credits from a Certificate program through to a Bachelor Degree allow students to remain marketable as the industry changes and seeks further education. The connection between the technical college and the university will distinguish this program and appeal to both student and employer.

COURSE DESCRIPTIONS

The following outlines the courses and descriptions required for graduation with a Certificate of Completion in Machine Tool Technology at USU Eastern.

EDDT 1040: CAD Level 1

3 Credits

Covers the fundamentals of computer-aided-drafting (AutoCAD). Students will train using basic operating features, menus, commands, file management, drawing set up, and plotting. Applications will include orthographic projection, section, dimensioning techniques, tracing, pictorial drawing, and coordinate features will be included.

EDDT 2620: 3D Modeling Advanced

3 Credits

Descriptive geometry and orthographic projection are the graphic tools of engineering. Students will learn to use the descriptive geometry to not only determine true size and shape, but also intersections, true distances, true distances of lines space, and exact piercing points. Students will solve practical problems applying the principles of descriptive geometry.

EDDT 2650: Mechanical Blueprint Reading

2 Credits

Support course to other departments. Designed to assist the technician in the interpretation of blueprints as they apply to industrial technology. Includes the introduction of technical drawing theory and practices. Students will be exposed to a wide variety of technical drawings in order to gain information about simple or complex parts, assemblies, systems, standards, and practices used in the world of manufacturing for precision and quality control.

ELET 1110: Technical Mathematics

3 Credits

This course covers various specialized mathematical topics necessary within the trades and industries careers. These topics include, but are not limited to, systems of units, units of measure, scientific vs. metric prefix notation, functions, complex numbers, and vectors.

MACH 1010: Machine Tool Technology 1

3 Credits

An introductory course to machining. Designed to develop skills needed to safely operate various hand tools, power equipment and precision measuring instruments related to the machining field.

MACH 1020: Machine Tool Technology 2

3 Credits

Second class in the machining program. Designed to develop skills needed to safely operate various power equipment and precision measuring instruments related to the machining field. Coursework will include: blueprint reading, developing skills in decision making to ensure that productivity and quality is obtained in a safe manner. Additional work on the Turning Machines will entail learning how to setup and operate manual lathes, perform basic and advanced machining operations, lathe cutting tools, all threading operations both internal and external as well as work on drill presses and related tooling.

MACH 1030: Machine Tool Technology 3

3 Credits

Intermediate/advanced course to machining. Designed to develop skills needed to safely operate various power equipment and precision measuring instruments related to the machining field. Students will learn to read blueprints, setup and operate manual machines, perform basic and advanced machining operations, develop skills in decision making to ensure that productivity and quality is obtained in a safe manner.

MACH 1040: Machine Tool Technology 4

3 Credits

Advanced course to machining. Designed to develop skills needed to safely operate various power equipment and precision measuring instruments related to the machining field. Students will learn to read blueprints, setups and operate manual machines, perform basic and advanced machining operations, develop skills in decision making to ensure that productivity and quality is obtained in a safe manner. Students will learn advanced work on the Turning machine, manual lathes, as well as an introduction to CNC lathes and mills. Theory and practice of the vertical milling machine, vertical milling machine construction and operation, and machine setup and milling will also be covered.

WELD 1010: Beginning Arc Welding
3 Credits

This course is intended for the general public and for related training programs such as diesel mechanics and machining. As a beginning course, it covers the basics of the most common arc welding processes such as SMAW, GMAW, and FCAW.

WELD 2600: Metallurgy
3 Credits

Designed for welding technology majors. Beginning course which covers the study of metal characteristics and how those characteristics are affected by common welding techniques. Common heat treating processes such as quenching, annealing, normalizing, tempering, and crystallization will be discussed. Students will learn to recognize the internal structures of various metals and metal identification techniques used in industry. Mechanical properties, failure and deformation, isothermal transformation diagrams and iron carbon diagrams will be discussed.

Students will be required to have at least one additional elective credit to meet the 30 credit minimum requirement for graduation with a Certificate of Completion.