## Foundational Courses

### TEMT 1000 Manufacturing Fundamentals — 3 Credits / 90 Clock-Hours

The Manufacturing Fundamentals course introduces students to basic procedures and operations encountered in the machine shop and various manufacturing industries. Topics include essential safety practices, use of basic measuring and hand tools, applications of pedestal grinding, and basic knowledge of sawing operations.

Objectives:
- Identify safe practices in a machine shop.
- Identify appropriate PPE.
- Demonstrate environmental awareness.
- Identify correct clean-up procedures.
- Interpret a Safety Data sheet (SDS).
- Perform basic measurement with calipers and micrometers.
- Perform basic layout procedures.
- Identify basic hand tools and their usage.
- Perform basic mathematical calculations.

### TEMT 1100 Mill Concepts — 3 Credits / 90 Clock-Hours

The Mill Concepts course introduces students to essential material cutting concepts using a milling machine. Topics include clamping and locating work pieces; selecting cutting tools and holders; milling speeds and feeds; applying cutting depth, width, and direction; part production; and inspection.

Objectives:
- Demonstrate safe operation of a milling machine.
- Demonstrate use of indicators relating to aligning work holding and figuring.
- Demonstrate proper machine maintenance and workstation cleanup.
- Demonstrate proper work holding device selection and setup.
- Demonstrate efficient speeds and feeds for mill tooling.
- Perform accurate milling of pockets, windows, and slots.
- Perform accurate hole-forming, mill operations for size and location.
- Perform accurate angle milling.
- Create and evaluate milled surface finishes.
- Perform calculations needed to operate precision machine.
- Inspect and document finish dimension using various metrology.

## TEMT 1150 CNC Mill Concepts — 3 Credits / 90 Clock-Hours

The CNC Mill Concepts course introduces students to CNC milling. Topics include safety, CNC terminology, preparing a CNC program, setup and operation of CNC milling machines, part production, and inspection.

Objectives:
- Demonstrate proper work holding for CNC machining.
- Demonstrate basic CNC machine setup.
- Demonstrate setting program zero for CNC machines.
- Perform manual mode operation, edit mode, MDI (manual data input) and program operation mode.
- Perform calculations needed to operate machine.
- Apply recognition of program codes to CNC machine operation.
- Apply knowledge of motion commands of rapid positioning, linear interpolation, and circular interpolation.
- Apply proper feeds, speeds, and chip load to quality part production.
- Apply CSS (Constant Surface Speed) and constant RPM (Revolutions Per Minute).
- Perform necessary operations to load a program, set tool offsets, and set cutter or nose radius compensations.
- Demonstrate use of indicators relating to aligning work holding and figuring.

## TEMT 1200 Lathe Concepts — 3 Credits / 90 Clock-Hours

The Lathe Concepts course introduces students to essential material cutting concepts using a precision lathe machine. Topics include holding and locating work pieces; selecting cutting tools and holders; turning speeds and feeds; applying cutting depth, width, and direction; part production; and inspection.

Objectives:
- Demonstrate safe operation of a precision lathe machine.
- Demonstrate proper machine maintenance and workstation cleanup.
- Demonstrate proper tool selection and application.
- Demonstrate proper work holding device selection and setup.
- Demonstrate efficient speeds and feeds for lathe tooling.
- Perform accurate facing operations.
- Perform accurate turning operations.
- Perform accurate chamfer/taper turning operations.
- Perform accurate hole-forming operations for size and location.
- Perform accurate threading operations.
- Perform accurate knurling operations.
- Perform calculations needed to operate precision machine.
- Inspect and document finish dimension using various metrology.

**TEMT 1250 CNC Lathe Concepts** **3 Credits / 90 Clock-Hours**

The CNC Lathe Concepts course introduces students to CNC turning. Topics include safety, CNC terminology, preparing a CNC program, setup and operation of CNC turning machines, part production, and inspection.

Objectives:
• Demonstrate proper work holding for CNC machining.
• Demonstrate basic CNC machine setup.
• Demonstrate setting program zero for CNC machines.
• Perform manual mode operation, edit mode, MDI (manual data input) and program operation mode.
• Apply recognition of program codes to CNC machine operation.
• Apply knowledge of motion commands of rapid positioning, linear interpolation, and circular interpolation.
• Apply proper feeds, speeds, and chip load to quality part production.
• Apply CSS (Constant surface speed) and constant RPM (Revolutions Per Minute).
• Perform necessary operations to load a program, set tool offsets, and set cutter or nose radius compensations.
• Perform calculations needed to operate machine.

## Supplemental Courses Varies by Institution

*Bridgerland*

**TEMT 1300 CNC Mill Programming** **3 Credits / 90 Clock-Hours**

The CNC Mill Programming course teaches the fundamentals of CAD/CAM systems. Topics include software operating systems, drawing commands, editing commands, tool-path generation, and posting a program.

Objectives:
• Create basic 2D geometry construction.
• Modify existing geometry.
• Demonstrate 2-Axis toolpath generation.
• Perform basic 2D toolpath editing.
• Demonstrate how to post a program to create NC code.
• Inspect and document finish dimensions using various metrology.
• Create advanced 2D geometry construction.
• Create 2-1/2 D geometry construction.
• Perform advanced modification of existing geometry.
• Demonstrate advanced 2D toolpath editing.
• Generate process and toolpath planning.
• Verify calculations needed to operate the machine effectively to create an acceptable project based on print specification.
• Inspect and document finish dimension using various metrology.

**TEMT 1350 CNC Lathe Programming** **3 Credits / 90 Clock-Hours**

The CNC Lathe Programming course teaches the fundamentals of CAD/CAM systems. Topics include software operating systems, drawing commands, editing commands, tool-path generation, and post a program.

Objectives:
• Create basic 2D geometry construction.
• Modify existing geometry.
• Demonstrate 2-Axis toolpath generation.
• Perform basic 2D toolpath editing.
• Demonstrate how to post a program file to create NC code.
• Create advanced 2D geometry construction.
• Perform advanced modification of existing geometry.
• Demonstrate advanced 2D toolpath editing.
• Perform calculations needed to operate precision machine.
• Verify calculations needed to operate the machine effectively to create an acceptable project based on print specification.
• Generate process and toolpath planning.
• Inspect and document finish dimension using various metrology.
• Generate toolpaths for CNC lathe.

**TEMT 2000 Process Control** **3 Credits / 90 Clock-Hours**

Process Control provides practice reading blueprints and technical drawings to create and inspect a part or assembly. This class will teach practical theory and provide hands-on experience in the proper use of common and advanced measuring tools found in the inspection room.

Objectives:
• Interpret basic blueprint symbols, line types, and views.
• Analyze title blocks and apply the data found there to the inspection process.
• Describe the basic Geometric Dimensioning and Tolerance (GD&T) symbols.
• Perform calculations needed in regards to process control.
• Demonstrate the proper use of micrometers, calipers, and other gaging tools required for part inspection.

**TEMT 2100 Advanced CNC Mill** **3 Credits / 90 Clock-Hours**

The Advanced CNC Mill course provides students with advanced practice in 3D Mastercam. This includes constructing 3D drawings and generating 3D milling toolpaths. Students demonstrate the setup and operation of CNC machines and part production.

Objectives:
• Demonstrate proper work holding, setup, feeds, speeds and chip load for CNC machining.
• Perform manual mode operation, edit mode, MDI (Manual Data Input) and program operation mode.
• Apply recognition of program codes to CNC machine operation and create CNC code in G&M format.
• Apply motion commands of rapid positioning, linear interpolation, and circular interpolation.
• Operate CNC machines using verification mode, single block, graphics, option stops, and feed and speed overrides.
• Properly use length offsets, radius compensation, fixture offsets, dimensional tool offsets, and tool nose radius offsets in CNC programs.
• Apply CSS (Constant Surface Speed) and constant RPM (Revolutions Per Minute).
• Use special features found on most CNC controls, including canned cycles, inch/metric input, dwell commands, sub programming, and roughing cycles for the turning centers.

**TEMT 2200 Advanced CNC Lathe** **3 Credits / 90 Clock-Hours**

The Advanced CNC Lathe course provides students with advanced practice in CAD/CAM programming, setup, and running parts on the CNC lathe. This includes constructing drawings and generating lathe toolpaths. Students demonstrate the setup and operation of CNC machines and part production.

Objectives:
• Demonstrate proper work holding, setup, feeds, speeds and chip load for CNC machining.
• Perform manual mode operation, edit mode, MDI (Manual Data Input) and program operation mode.
• Apply recognition of program codes to CNC machine operation, and create CNC code in G&M format.
• Apply motion commands of rapid positioning, linear interpolation, and circular interpolation.
• Operate CNC machines using verification mode, single block, graphics, option stops, and feed and speed overrides.
• Properly use length offsets, radius compensation, fixture offsets, dimensional tool offsets, and tool nose radius offsets in CNC programs.
• Apply CSS (Constant Surface Speed) and constant RPM (Revolutions Per Minute).
• Use special features found on most CNC controls, including canned cycles, inch/metric input, dwell commands, sub programming, and roughing cycles for the turning centers.

**TEMT 2300 Multi-Axis** **3 Credits / 90 Clock-Hours**

Multi-Axis introduces CNC multi-axis machines. Topics include the procedures and practices for safe setup and operation of the machine, tool-holding and work holding selection, programming in CAD/CAM software for multi-axis machines, part production, and inspection.

Objectives:
• Identify the correct nomenclature of the machine.
• Create wireframe and solid models.
• Create additional planes for tool pathing.
• Perform 2D, 3D, 3+2, and full 5th axis tool pathing.
• Demonstrate solid model modification.
• Perform calculations needed to operate machines.
• Perform part setup and fixturing operations.
• Perform tool setup and set tool offsets.
• Demonstrate proving out a program safely.

**TEMT 2400 Swiss Screw Machine Concepts** **3 Credits / 90 Clock-Hours**

The Swiss Screw Machine Concepts course provides students basic knowledge of and initial experience with Swiss-style screw machines. These machines are used to produce bulk quantities of custom parts that serve various industries including medical, aerospace, and technology.

Objectives:
• Demonstrate safe work habits and be conscious of safety when working with machinery.
• Read blueprints, interpret drawings, understand specifications, and establish tolerances.
• Apply mathematics in machine tool technology (speeds, feeds, thread measurement, sine bar, etc.).
• Review products to ensure they meet quality standards using quality control, inspection, and gauging methods.
• Ensure consistent quality when performing large-scale production.
• Set fixture offsets, tool length offsets, geometry and wear offsets on a Swiss screw machine to manufacture piece parts to drawing specifications.
• Prepare a simple program to machine parts per drawing specifications.
• Safely operate a Swiss screw machine and demonstrate knowledge of their capabilities in relation to the manufacturing industry.

*Davis*

**TEMT 1020 Machining for Manufacturing** **3 Credits / 90 Clock-Hours**

Machining for Manufacturing emphasizes the basic procedures and machining operations encountered in the machine shop. Students will study topics including instruction in machine safety, basic measuring tools, shop math, speeds and feeds, and metal identification. Students will also operate engine lathe and vertical mills.

Objectives:
• Demonstrate accurate use and reading of steel rules, micrometers, and calipers.
• Demonstrate proper feeds and speeds.
• Identify common hole making tools.
• Identify safe practices when using lathes.
• Identify safe practices when using mills.
• Perform basic turning and milling operations.

**TEMT 1160 Vertical Mill Operations** **3 Credits / 90 Clock-Hours**

In this course, students will be introduced to essential material cutting concepts by setting up and operating a manual milling machine. Topics include principles of clamping and locating work pieces; selection of cutting tools and holders; milling speeds and feeds; application of cutting depth, width, and direction; part production; and inspection.

Objectives:
• Demonstrate:
o Safe operation of a milling machine.
o Proper machine maintenance and workstation cleanup.
o Proper work holding device selection and setup.
o Efficient speeds and feeds for mill tooling.
• Perform accurate:
o Milling of pockets and windows & slots.
o Hole forming mill operations for size and location.
o Angle milling.
• Create and evaluate milled surface finishes.

**TEMT 1205 Lathe Operations** **3 Credits / 90 Clock-Hours**

Lathe Operations will introduce essential material cutting concepts. This course provides instruction in tool selection, setup, work holding, and basic turning operations.

Objectives:
• Identify the parts of a lathe and the different styles/models of lathes.
• Demonstrate safe operation, maintenance & cleanup of a lathe.
• Demonstrate efficient speeds and feeds for lathe tooling.
• Demonstrate proper:
o Work holding device selection and setup.
o Lathe cutting tool selection and setup.
• Perform lathe OD machining operations according to industry standards.
• Perform lathe ID machining operations according to industry standards.
• Create and evaluate surface finishes.
• Perform cutting and measuring of threads.

**TEMT 1360 Mazatrol Programming** **3 Credits / 90 Clock-Hours**

Mazatrol Programming introduces operating and programming controls and cutting tools as it relates to programming. During this course, students will demonstrate knowledge by programming both CNC machining and turning centers using the Mazatrol conversational language.

Objectives:
• Demonstrate:
o Proper use of reference materials
o Proper procedures in setting tool length offsets, tool library, part zero offsets.
o Ability to set-up and run existing programs.
• Identify and use operator and programming controls.
• Create a program for the CNC machining center and CNC turning center using blueprints and Mazatrol programming language for the production of industry standard parts.

**TEMT 1505 Geometric Dimensioning and Tolerancing** **3 Credits / 90 Clock-Hours**

Geometric Dimensioning and Tolerancing introduces students to the basic concepts of geometric dimensioning and tolerancing (GD&T). This course emphasizes terminology, planar datums, size datums, and tolerances of size, and form and location.

Objectives:
• Define Maximum Material Condition (MMC), Least Material Condition (LMC), and Regardless of Feature Size (RFS).
• Explain how to use GD&T to determine tolerances of form and location, positional tolerances, and part fits.
• Define geometric characteristic symbols and how they are used in GD&T.
• Define feature control frames.
• Given a basic blueprint, identify basic dimensions.
• Define datums and explain their application in GD&T.
• Demonstrate the skills gained in the course by completing the print exercises and tests given in the textbook.

**TEMT 1550 Inspection Fundamentals** **3 Credits / 90 Clock-Hours**

Inspection Fundamentals defines basic procedures and inspection operations encountered in the machine shop. In this course, students will practice reading blueprints & technical drawings in order to create and inspect a part or assembly. Students will be trained in the proper use of common measuring tools as well as more advanced measuring tools found in the inspection room.

Objectives:
• Interpret basic blueprint symbols, line types, and views.
• Analyze title blocks and apply the data found there to the inspection process.
• Describe the basic GD&T symbols.
• Demonstrate the proper use of micrometers, calipers, and other hard gaging tools.
• Demonstrate Inspection techniques using digital height gages and equator machines.

**TEMT 1570 Advanced Inspection** **3 Credits / 90 Clock-Hours**

Advanced Inspection will teach students the foundational skills of CMM (Coordinate Measuring Machine) operation, and programming. This course teaches industry standards, program file management, calibration, and programming.

Objectives:
• Explain the 6 Degrees of Freedom.
• Demonstrate the setup and calibration of a CMM.
• Create and manage project files.
• Program the part inspection.
• Output the inspection data.

**TEMT 1860 Additive Manufacturing** **3 Credits / 90 Clock-Hours**

This course will focus on the field of design for additive manufacturing also known as 3D printing. The course will use design-based problems, and project-based learning (hands-on) to aid students in developing the design and research skills required to function within the area of design for additive manufacturing. As a student in this course, you will be expected to gain understanding and skillsets in computer-aided design (CAD) with 3D printing, manufacturing, and research knowledge. (Prior CAD experience required for this course).

Objectives:
• Demonstrate:
o Efficient use of machine and additive practices.
o Proper machine maintenance and workstation cleanup.
o Proper device selection and setup.
• Perform:
o Designed parts are designed with additive printing in mind.
o Demonstrate proper settings for specific applications.
o Designs in fixturing to machine parts.
o Ability to design parts accurately for CMM inspection.
o Reverse engineer and make rapid prototypes.
• Create and evaluate milled surface finishes.

**TEMT 2130 CNC III** **3 Credits / 90 Clock-Hours**

CNC III provides training on multiple full-sized CNC machining centers. In this course, students will use the latest industry trends in regard to tool measurement and work coordinate systems. The parts will be more complex and require multiple tools. The cutters and material will require more skill in both the CAD/CAM as well as setup and operation of the CNC.

Objectives:
• Execute the design and program multi-axis parts.
• Demonstrate setting up machines for multi-axis parts.
• Construct the design, program and run simple molds.
• Identify the use of multiple work coordinates.
• Demonstrate fine detail surfacing of parts.

**TEMT 2150 5th Axis Programming** **3 Credits / 90 Clock-Hours**

This course will focus on the field of design for 5th Axis Setup and Machining. The course will use design-based problems, and project-based learning (hands-on) to aid students in developing the design and research skills required to function within the area of 5th Axis manufacturing. As a student in this course, you will be expected to gain understanding and skillsets in computer-aided design (CAD) with 5 Axis manufacturing, and research knowledge. (Prior CAD experience required for this course).

Objectives:
• Demonstrate:
o Efficient use of machine and additive practices.
o Proper machine maintenance and workstation cleanup.
o Proper device selection and setup.
• Perform:
o Designed parts are designed with 5 axis machining in mind.
o Demonstrate proper settings for specific applications.
o Designs in fixturing to machine parts.
o Ability to design parts accurately for CMM inspection.
• Create and evaluate milled surface finishes.

**TEMT 2810 Special Projects I** **1 Credit / 30 Clock-Hours**

This is a special course designed to allow students additional time when building complex projects found in Special Projects II as assigned by an Advisor. This course is also used to allow students time to prepare for the Skills USA state or national contest. Students in this course will receive additional instructor-led guidance to build upon prior instruction and experience to meet or exceed industry standards. Students will practice and demonstrate professional -level work according to industry standards.

Objectives:
• Demonstrate project bid creation by estimating completion time and necessary materials to complete a machining project.
• Given a sketch or blueprint from a client, create the requested project to industry standards.
• Demonstrate and apply proper inspection techniques to ensure parts are accurate and compatible.

**TEMT 2820 Special Projects II** **2 Credits / 60 Clock-Hours**

This is an advanced course designed to allow students to participate in complex projects related to CNC machining and programming as assigned by an Advisor. Coursework will vary with the work available and may involve regional industry. Students in this course will receive additional instructor-led guidance to build upon prior instruction and experience to meet or exceed industry standards. Students will practice and demonstrate professional-level work according to industry standards.

Objectives:
• Demonstrate project bid creation by estimating completion time and necessary materials to complete a machining project.
• Given a sketch or blueprint from a client, create the requested project to industry standards.
• Demonstrate and apply proper inspection techniques to ensure parts are accurate and compatible.

**TEMT 2850 Workplace Management** **2 Credits / 60 Clock-Hours**

This course is designed to help students starting their career in the CNC machining industry. Students begin this process learning critical fundamental skills such as job knowledge, fire safety and teamwork. Students have the opportunity to help other students as well as present to the group something they learned or found interesting in this course. Student will also be asked to create a LinkedIn account as well as CNC Expert to create a resume that they can show potential employers. In this course students will act as a shop lead, working closely with the instructors to develop team building, communication, conflict resolution skills and complete a team project.

Objectives:
• Demonstrate teamwork and problem solving by acting as shop lead for a few days.
• Demonstrate fire safety and prevention strategies.
• Create a presence on LinkedIn & CNC Expert.
• Create an up-to-date resume outlining their skills in CNC machining.
• Demonstrate time management skills by keeping accurate track of course timelines, proper login/log out on the attendance station and course progress by meeting with an instructor at least once during each course.
• Explore at least one manufacturing company and report findings in an oral report to the class.

**WKSK 1500 Job Seeking Skills** **1 Credit / 30 Clock-Hours**

Job Seeking Skills explores how to prepare and successfully apply to potential career opportunities. During this course, you will be presented with essential job-seeking skills needed to find gainful employment.

Objectives:
• Create a professional resume, cover letter and reference sheet.
• Utilize online tools successfully to create an e-portfolio.
• Expand and develop networking skills.
• Utilize online resources effectively to find job openings.
• Demonstrate the ability to fill out job applications in a professional manner.
• Perform successfully in a job interview.
• Demonstrate appropriate follow-up procedures.

*Dixie*

**TEMT 1010 Career Success** **1 Credit / 30 Clock-Hours**

The Career Success course helps prepare students to interview for a new job. Topics include professional attire and demeanor for the interview, the importance of including a list of references with their resume, and comporting a positive and upbeat attitude before, during, and after the interview. Students will also map the distance to the interview location to determine travel distance. Students will participate in discussions on the longevity at the job including the difference between lateral and vertical career pathways.

Objectives:
• Demonstrate professional dress, grooming, hygiene, and attitude.
• Create an updated resume with a list of at least three references.
• Demonstrate time keeping and punctuality.
• Communicate positively both verbally and nonverbally.
• Show and explain case parts for an interview setting.
• Create a plan to keep the job, including plans of moving laterally and vertically within the workplace.
• Demonstrate and explain the proper use of cell phones in a work environment.

**TEMT 1300 CNC Mill Programming** **3 Credits / 90 Clock-Hours**

The CNC Mill Programming course teaches the fundamentals of CAD/CAM systems. Topics include software operating systems, drawing commands, editing commands, tool-path generation, and posting a program.

Objectives:
• Create basic 2D geometry construction.
• Modify existing geometry.
• Demonstrate 2-Axis toolpath generation.
• Perform basic 2D toolpath editing.
• Demonstrate how to post a program to create NC code.
• Inspect and document finish dimensions using various metrology.
• Create advanced 2D geometry construction.
• Create 2-1/2 D geometry construction.
• Perform advanced modification of existing geometry.
• Demonstrate advanced 2D toolpath editing.
• Generate process and toolpath planning.
• Verify calculations needed to operate the machine effectively to create an acceptable project based on print specification.
• Inspect and document finish dimension using various metrology.

**TEMT 1350 CNC Lathe Programming** **3 Credits / 90 Clock-Hours**

The CNC Lathe Programming course teaches the fundamentals of CAD/CAM systems. Topics include software operating systems, drawing commands, editing commands, tool-path generation, and post a program.

Objectives:
• Create basic 2D geometry construction.
• Modify existing geometry.
• Demonstrate 2-Axis toolpath generation.
• Perform basic 2D toolpath editing.
• Demonstrate how to post a program file to create NC code.
• Create advanced 2D geometry construction.
• Perform advanced modification of existing geometry.
• Demonstrate advanced 2D toolpath editing.
• Perform calculations needed to operate precision machine.
• Verify calculations needed to operate the machine effectively to create an acceptable project based on print specification.
• Generate process and toolpath planning.
• Inspect and document finish dimension using various metrology.
• Generate toolpaths for CNC lathe.

**TEMT 1450 CNC II** **6 Credits / 180 Clock-Hours**

The CNC II course teaches students additional practical abilities including more than three axis directions of movement to machine complex geometries. Students will learn to program CAD/CAM software to create a number of projects, each building on their CNC machining skills. Students will machine with a variety of materials to practice efficiency, processes, applications, and accuracy in both tramming, squaring, and calibrating the machine as well as creating precision projects.

Objectives:
• Use a multi-axis machine.
• Machine with a variety of material types.
• Create diverse CNC projects.
• Program CAD/CAM software to create multiple projects.

**TEMT 1500 Measuring Analysis** **2 Credits / 60 Clock-Hours**

The Measuring Analysis course teaches students repetitive measurements for part inspection. Students will learn how to operate an Optical Comparator to measure various parts sizes using a magnified silhouette of a part projected on a screen, and the dimensions and geometry of the part are measured against prescribed limits. Students will learn the MSA method to determine an acceptable measurement average from a sample of parts. In Process Controls students learn to gather data to determine which machining process is the most suitable for a workpiece to ultimately improve quality and reliability of a process. Students will receive training in practical theory and hands-on experience, in the proper use of common measuring tools as well as more advanced measuring tools found in the inspection room.

Objectives:
• Demonstrate a repetitive MSA measuring method using a sample of parts.
• Operate an Optical Comparator to measure the dimensions and geometry of the part against prescribed limits.
• Utilize the process controls process to determine which machining process is most suitable for a project.
• Practice repetitive measurements for part inspection.

*Mountainland*

**TEMT 1050 Advanced Manufacturing Fundamentals** **3 Credits / 90 Clock-Hours**

The Advanced Manufacturing Fundamentals course teaches students to interpret information on blueprints used in manufacturing to machine parts within defined tolerances. Students will learn methods used in inspecting parts to ensure parts are made to the print requirements.

Objectives:
• Apply tolerancing concepts and rules.
• Demonstrate how datums work.
• Demonstrate how features frames work.
• Interpret basic blueprint symbols, line types, and views.
• Analyze title blocks and apply the data to the inspection process.
• Describe the basic Geometric Dimensioning and Tolerance (GD&T) symbols.
• Properly use micrometers, calipers, and other gaging tools.
• Use Coordinate Measuring Machines and Optical Comparators.

**TEMT 1300 CNC Mill Programming** **3 Credits / 90 Clock-Hours**

The CNC Mill Programming course teaches the fundamentals of CAD/CAM systems. Topics include software operating systems, drawing commands, editing commands, tool-path generation, and posting a program.

Objectives:
• Create basic 2D geometry construction.
• Modify existing geometry.
• Demonstrate 2-Axis toolpath generation.
• Perform basic 2D toolpath editing.
• Demonstrate how to post a program to create NC code.
• Inspect and document finish dimensions using various metrology.
• Create advanced 2D geometry construction.
• Create 2-1/2 D geometry construction.
• Perform advanced modification of existing geometry.
• Demonstrate advanced 2D toolpath editing.
• Generate process and toolpath planning.
• Verify calculations needed to operate the machine effectively to create an acceptable project based on print specification.
• Inspect and document finish dimension using various metrology.

**TEMT 1350 CNC Lathe Programming** **3 Credits / 90 Clock-Hours**

The CNC Lathe Programming course teaches the fundamentals of CAD/CAM systems. Topics include software operating systems, drawing commands, editing commands, tool-path generation, and post a program.

Objectives:
• Create basic 2D geometry construction.
• Modify existing geometry.
• Demonstrate 2-Axis toolpath generation.
• Perform basic 2D toolpath editing.
• Demonstrate how to post a program file to create NC code.
• Create advanced 2D geometry construction.
• Perform advanced modification of existing geometry.
• Demonstrate advanced 2D toolpath editing.
• Perform calculations needed to operate precision machine.
• Verify calculations needed to operate the machine effectively to create an acceptable project based on print specification.
• Generate process and toolpath planning.
• Inspect and document finish dimension using various metrology.
• Generate toolpaths for CNC lathe.

**TEMT 1650 Applied Manual Machining** **3 Credits / 90 Clock-Hours**

In the Applied Manual Machining course, students will learn to apply what they have been taught in the previous courses to manufacturing various part assemblies. Topics will include reading and interpreting prints and the use of machines to manufacture various parts and assemble them into a working assembly.

Objectives:
• Operate manual lathes and milling machines.
• Properly use measuring tools to make the parts to the required tolerances.
• Make parts into working assemblies.

**TEMT 2300 Multi-Axis** **3 Credits / 90 Clock-Hours**

Multi-Axis introduces CNC multi-axis machines. Topics include the procedures and practices for safe setup and operation of the machine, tool-holding and work holding selection, programming in CAD/CAM software for multi-axis machines, part production, and inspection.

Objectives:
• Identify the correct nomenclature of the machine.
• Create wireframe and solid models.
• Create additional planes for tool pathing.
• Perform 2D, 3D, 3+2, and full 5th axis tool pathing.
• Demonstrate solid model modification.
• Perform calculations needed to operate machines.
• Perform part setup and fixturing operations.
• Perform tool setup and set tool offsets.
• Demonstrate proving out a program safely.

*Ogden-Weber*

**TEMT 1300 CNC Mill Programming** **3 Credits / 90 Clock-Hours**

The CNC Mill Programming course teaches the fundamentals of CAD/CAM systems. Topics include software operating systems, drawing commands, editing commands, tool-path generation, and posting a program.

Objectives:
• Create basic 2D geometry construction.
• Modify existing geometry.
• Demonstrate 2-Axis toolpath generation.
• Perform basic 2D toolpath editing.
• Demonstrate how to post a program to create NC code.
• Inspect and document finish dimensions using various metrology.
• Create advanced 2D geometry construction.
• Create 2-1/2 D geometry construction.
• Perform advanced modification of existing geometry.
• Demonstrate advanced 2D toolpath editing.
• Generate process and toolpath planning.
• Verify calculations needed to operate the machine effectively to create an acceptable project based on print specification.
• Inspect and document finish dimension using various metrology.

**TEMT 1350 CNC Lathe Programming** **3 Credits / 90 Clock-Hours**

The CNC Lathe Programming course teaches the fundamentals of CAD/CAM systems. Topics include software operating systems, drawing commands, editing commands, tool-path generation, and post a program.

Objectives:
• Create basic 2D geometry construction.
• Modify existing geometry.
• Demonstrate 2-Axis toolpath generation.
• Perform basic 2D toolpath editing.
• Demonstrate how to post a program file to create NC code.
• Create advanced 2D geometry construction.
• Perform advanced modification of existing geometry.
• Demonstrate advanced 2D toolpath editing.
• Perform calculations needed to operate precision machine.
• Verify calculations needed to operate the machine effectively to create an acceptable project based on print specification.
• Generate process and toolpath planning.
• Inspect and document finish dimension using various metrology.
• Generate toolpaths for CNC lathe.

**TEMT 1565 Advanced Print Reading** **3 Credits / 90 Clock-Hours**

Advanced Print Reading teaches students to interpret information on blueprints used in manufacturing. Topics include mathematical calculations, symbols, terms, datum, material condition modifiers, and application of tolerance zones.

Objectives:
• Demonstrate how tolerancing concepts and rules apply in print reading.
• Demonstrate how datums work on a print.
• Demonstrate how feature control frames work in applying print reading concepts.
• Identify and interpret all symbols on a manufacturing print.
• Perform calculations related to print reading.

**TEMT 2000 Process Control** **3 Credits / 90 Clock-Hours**

Process Control provides practice reading blueprints and technical drawings to create and inspect a part or assembly. This class will teach practical theory and provide hands-on experience in the proper use of common and advanced measuring tools found in the inspection room.

Objectives:
• Interpret basic blueprint symbols, line types, and views.
• Analyze title blocks and apply the data found there to the inspection process.
• Describe the basic Geometric Dimensioning and Tolerance (GD&T) symbols.
• Perform calculations needed in regards to process control.
• Demonstrate the proper use of micrometers, calipers, and other gaging tools required for part inspection.

**TEMT 2300 Multi-Axis** **3 Credits / 90 Clock-Hours**

Multi-Axis introduces CNC multi-axis machines. Topics include the procedures and practices for safe setup and operation of the machine, tool-holding and work holding selection, programming in CAD/CAM software for multi-axis machines, part production, and inspection.

Objectives:
• Identify the correct nomenclature of the machine.
• Create wireframe and solid models.
• Create additional planes for tool pathing.
• Perform 2D, 3D, 3+2, and full 5th axis tool pathing.
• Demonstrate solid model modification.
• Perform calculations needed to operate machines.
• Perform part setup and fixturing operations.
• Perform tool setup and set tool offsets.
• Demonstrate proving out a program safely.

*Salt Lake*

**TEMT 1310 CNC Programming** **3 Credits / 90 Clock-Hours**

The CNC Programming course teaches the fundamentals of Word Address programming on multi-axis CNC machines utilizing CAD/CAM systems and programming by hand at the machine. Topics include software operating systems, drawing commands, editing commands, tool-path generation, and posting a program.

Objectives:
• Create and modify a basic geometry construction.
• Demonstrate toolpath generation and editing.
• Demonstrate how to post a program to create NC code.
• Inspect and document finish dimensions using various metrology.

*Snow*

**TEMT 1300 CNC Mill Programming** **3 Credits / 90 Clock-Hours**

The CNC Mill Programming course teaches the fundamentals of CAD/CAM systems. Topics include software operating systems, drawing commands, editing commands, tool-path generation, and posting a program.

Objectives:
• Create basic 2D geometry construction.
• Modify existing geometry.
• Demonstrate 2-Axis toolpath generation.
• Perform basic 2D toolpath editing.
• Demonstrate how to post a program to create NC code.
• Inspect and document finish dimensions using various metrology.
• Create advanced 2D geometry construction.
• Create 2-1/2 D geometry construction.
• Perform advanced modification of existing geometry.
• Demonstrate advanced 2D toolpath editing.
• Generate process and toolpath planning.
• Verify calculations needed to operate the machine effectively to create an acceptable project based on print specification.
• Inspect and document finish dimension using various metrology.

**TEMT 1350 CNC Lathe Programming** **3 Credits / 90 Clock-Hours**

The CNC Lathe Programming course teaches the fundamentals of CAD/CAM systems. Topics include software operating systems, drawing commands, editing commands, tool-path generation, and post a program.

Objectives:
• Create basic 2D geometry construction.
• Modify existing geometry.
• Demonstrate 2-Axis toolpath generation.
• Perform basic 2D toolpath editing.
• Demonstrate how to post a program file to create NC code.
• Create advanced 2D geometry construction.
• Perform advanced modification of existing geometry.
• Demonstrate advanced 2D toolpath editing.
• Perform calculations needed to operate precision machine.
• Verify calculations needed to operate the machine effectively to create an acceptable project based on print specification.
• Generate process and toolpath planning.
• Inspect and document finish dimension using various metrology.
• Generate toolpaths for CNC lathe.

**TEMT 1565 Advanced Print Reading** **3 Credits / 90 Clock-Hours**

Advanced Print Reading teaches students to interpret information on blueprints used in manufacturing. Topics include mathematical calculations, symbols, terms, datum, material condition modifiers, and application of tolerance zones.

Objectives:
• Demonstrate how tolerancing concepts and rules apply in print reading.
• Demonstrate how datums work on a print.
• Demonstrate how feature control frames work in applying print reading concepts.
• Identify and interpret all symbols on a manufacturing print.
• Perform calculations related to print reading.

**TEMT 2000 Process Control** **3 Credits / 90 Clock-Hours**

Process Control provides practice reading blueprints and technical drawings to create and inspect a part or assembly. This class will teach practical theory and provide hands-on experience in the proper use of common and advanced measuring tools found in the inspection room.

Objectives:
• Interpret basic blueprint symbols, line types, and views.
• Analyze title blocks and apply the data found there to the inspection process.
• Describe the basic Geometric Dimensioning and Tolerance (GD&T) symbols.
• Perform calculations needed in regards to process control.
• Demonstrate the proper use of micrometers, calipers, and other gaging tools required for part inspection.

**TEMT 2300 Multi-Axis** **3 Credits / 90 Clock-Hours**

Multi-Axis introduces CNC multi-axis machines. Topics include the procedures and practices for safe setup and operation of the machine, tool-holding and work holding selection, programming in CAD/CAM software for multi-axis machines, part production, and inspection.

Objectives:
• Identify the correct nomenclature of the machine.
• Create wireframe and solid models.
• Create additional planes for tool pathing.
• Perform 2D, 3D, 3+2, and full 5th axis tool pathing.
• Demonstrate solid model modification.
• Perform calculations needed to operate machines.
• Perform part setup and fixturing operations.
• Perform tool setup and set tool offsets.
• Demonstrate proving out a program safely.

*USU-Eastern*

**TEMT 1300 CNC Mill Programming** **3 Credits / 90 Clock-Hours**

The CNC Mill Programming course teaches the fundamentals of CAD/CAM systems. Topics include software operating systems, drawing commands, editing commands, tool-path generation, and posting a program.

Objectives:
• Create basic 2D geometry construction.
• Modify existing geometry.
• Demonstrate 2-Axis toolpath generation.
• Perform basic 2D toolpath editing.
• Demonstrate how to post a program to create NC code.
• Inspect and document finish dimensions using various metrology.
• Create advanced 2D geometry construction.
• Create 2-1/2 D geometry construction.
• Perform advanced modification of existing geometry.
• Demonstrate advanced 2D toolpath editing.
• Generate process and toolpath planning.
• Verify calculations needed to operate the machine effectively to create an acceptable project based on print specification.
• Inspect and document finish dimension using various metrology.

**TEMT 1350 CNC Lathe Programming** **3 Credits / 90 Clock-Hours**

The CNC Lathe Programming course teaches the fundamentals of CAD/CAM systems. Topics include software operating systems, drawing commands, editing commands, tool-path generation, and post a program.

Objectives:
• Create basic 2D geometry construction.
• Modify existing geometry.
• Demonstrate 2-Axis toolpath generation.
• Perform basic 2D toolpath editing.
• Demonstrate how to post a program file to create NC code.
• Create advanced 2D geometry construction.
• Perform advanced modification of existing geometry.
• Demonstrate advanced 2D toolpath editing.
• Perform calculations needed to operate precision machine.
• Verify calculations needed to operate the machine effectively to create an acceptable project based on print specification.
• Generate process and toolpath planning.
• Inspect and document finish dimension using various metrology.
• Generate toolpaths for CNC lathe.

**TEMT 1400 Introduction to CNC Machining** **3 Credits / 90 Clock-Hours**

The Introduction to CNC Machining course introduces students to Computer-Numeric Control (CNC) Machining at an entry-level. Topics include CNC terminology CNC operation and performing part Production and inspection.

Objectives:
• Explain basic elements of G and M code.
• Demonstrate safety practices and techniques for a machine shop.
• Properly perform a basic start-up of a CNC machine.
• Correctly load a part.
• Run basic programs on a CNC machine.
• Explain the various functions of the CNC control keypad and screen.
• Select the correct tooling for operations.
• Demonstrate appropriate preventative maintenance of a CNC machine.

**TEMT 1565 Advanced Print Reading** **3 Credits / 90 Clock-Hours**

Advanced Print Reading teaches students to interpret information on blueprints used in manufacturing. Topics include mathematical calculations, symbols, terms, datum, material condition modifiers, and application of tolerance zones.

Objectives:
• Demonstrate how tolerancing concepts and rules apply in print reading.
• Demonstrate how datums work on a print.
• Demonstrate how feature control frames work in applying print reading concepts.
• Identify and interpret all symbols on a manufacturing print.
• Perform calculations related to print reading.

**TEMT 1600 Introduction to Manual Machining** **3 Credits / 90 Clock-Hours**

This course is designed to develop skills needed to safely operate various hand tools, power equipment, and precision measuring instruments related to the machining field. Safety measures will be followed while developing decision-making skills to maintain productivity and quality.

Objectives:
• Demonstrate safe practices in the shop.
• Read and interpret machining blueprints.
• Demonstrate precision measurement techniques.
• Properly use common hand and power tools including:
o saws.
o Drill presses.
o Bench grinders.
• Demonstrate manual lathe operations.
• Demonstrate work holding procedures.