

# MACHINE TECHNOLOGY (MACH)

---

## **MACH 098 Directed Study in Machine Technology 0.5-9 Units**

Individual or small groups of students, with previous course work in the discipline, who would benefit from Independent Study under the direction of faculty members in specific or related disciplines, may develop individualized learning contracts designed to enhance their individual instructional programs. The students and the faculty member in consultation with the Division Dean will determine appropriate learning objectives and activities as well as the numbers of units to be earned. Instructions and the Learning Contract forms are available in the Division Office. Repeatable to a maximum of 9 units across all disciplines. Lecture Hours: None Lab Hours: 2.07 Repeatable: Yes Grading: L Prerequisite: MACH 129 or MACH 151A or MACH 151B or MACH 154; with a C or better

Advisory Level: Read: 3 Write: 3 Math: 2

Transfer Status: CSU Degree Applicable: AA/AS

CSU GE: None IGETC: None District GE: None

## **MACH 100 Shop Math and Drawings 4 Units**

Students study shop mathematics and drawings for the machine trades.

Lecture Hours: 4 Lab Hours: None Repeatable: No Grading: L

Advisory Level: Read: 3 Write: 3 Math: None

Transfer Status: CSU Degree Applicable: AA/AS

CSU GE: None IGETC: None District GE: None

Credit by Exam: Yes

## **MACH 101 Introduction to Machine Technology 3 Units**

Students will be introduced to machining, including the safe and correct use of mills, lathes, band saws, grinders, and drill presses. Students will interpret engineering drawings and solid models as well as appreciate the significance of measurement in both inch and metric systems. Student will also learn to identify metals and their significant properties. Geometry will be reviewed.

Lecture Hours: 2 Lab Hours: 3 Repeatable: No Grading: L

Advisory Level: Read: 3 Write: 3 Math: 2

Transfer Status: CSU Degree Applicable: AA/AS

CSU GE: None IGETC: None District GE: None

Credit by Exam: Yes

## **MACH 109 Introduction to Coordinate Measurement Machine 3 Units**

Students will study the parts and requirements of a Zeiss Coordinate Measurement Machine (CMM). Setup, calibration, and measurement techniques will be demonstrated. Special emphasis will be placed on learning Calypso software to create inspection programs using step files or drawings.

Lecture Hours: 2 Lab Hours: 3 Repeatable: No Grading: L

Advisory Level: Read: 3 Write: 3 Math: None

Transfer Status: CSU Degree Applicable: AA/AS

CSU GE: None IGETC: None District GE: None

Credit by Exam: Yes

## **MACH 110 Geometric Dimensioning & Tolerancing (GD&T) Measurement 4 Units**

Students learn Geometric Dimensioning and Tolerancing (GD&T) symbols and interpretation, and their related application and inspection. Students will also learn practical precision measurement and instrument selection. This course helps students prepare for the GD&T Technologist certification exam. Students will use a Coordinate Measurement Machine for inspection purposes.

Lecture Hours: 3 Lab Hours: 3 Repeatable: No Grading: L

Prerequisite: MACH 100 or MACH 120; minimum grade of C

Advisory Level: Read: 3 Write: 3 Math: 2

Transfer Status: CSU Degree Applicable: AA/AS

CSU GE: None IGETC: None District GE: None

Credit by Exam: Yes

## **MACH 120 Basic CNC Machining Center/CNC Mill 4.5 Units**

Students will study basic set-up procedures and safe use of CNC (Computerized Numerical Controls) Machining Centers/CNC Mill.

Students will be introduced to CNC codes, control functions, examining and editing programs, part production, and the proper use of speeds and feeds. Students will use different measurement tools to inspect dimensions according to blueprint specifications. They will also learn basic blueprint reading and the use of the sine bar.

Lecture Hours: 3 Lab Hours: 5 Repeatable: No Grading: L

Advisory Level: Read: 3 Write: 3 Math: 1

Transfer Status: CSU Degree Applicable: AA/AS

CSU GE: None IGETC: None District GE: None

Credit by Exam: Yes

## **MACH 123 Basic CNC Lathe 4.5 Units**

Students will study basic set-up procedures and the safe use of CNC (Computerized Numerical Controls) Turning Centers or CNC Lathes. Students will be introduced to the use of CNC lathe codes and control functions. Students will examine and edit programs, determine proper use of speeds and feeds to produce parts. They will inspect final product according to blueprint specifications.

Lecture Hours: 3 Lab Hours: 5 Repeatable: No Grading: L

Advisory Level: Read: 3 Write: 3 Math: 1

Transfer Status: CSU Degree Applicable: AA/AS

CSU GE: None IGETC: None District GE: None

Credit by Exam: Yes

## **MACH 126 Advanced CNC Machining Center and Turning Center 4.5 Units**

Students study advanced set-up procedures and the safe use of CNC (Computerized Numerical Controls) Mills and CNC Lathes. Students will study industry techniques in the set-up of CNC Mills and CNC Lathes, including work hold devices, indexing and rotary devices, and various machine operations. Students will use different measurement tools to inspect dimensions, applying more advanced concepts.

Lecture Hours: 3 Lab Hours: 5 Repeatable: No Grading: L

Prerequisite: MACH 120 or MACH 123; both with C or better

Advisory Level: Read: 3 Write: 3 Math: 1

Transfer Status: CSU Degree Applicable: AA/AS

CSU GE: None IGETC: None District GE: None

Credit by Exam: Yes

**MACH 129 CNC Programming and Operations 4.5 Units**

Students will learn to optimize Computer Numerical Control (CNC) programs and operations in both CNC Mills and CNC Lathes. They will study how to increase equipment utilization and avoid equipment downtime. This class introduces students to different CAD/CAM systems and their application to basic CNC programs. Students learn to create, load, correct, and save CNC programs. They will use a Coordinate Measurement Machine (CMM) to inspect parts and generate inspection reports.

Lecture Hours: 3 Lab Hours: 5 Repeatable: No Grading: L  
Prerequisite: MACH 120 or MACH 123 with a C or better  
Advisory Level: Read: 3 Write: 3 Math: 1  
Transfer Status: CSU Degree Applicable: AA/AS  
CSU GE: None IGETC: None District GE: None  
Credit by Exam: Yes

**MACH 138 Work Experience 1-8 Units**

Work Experience is designed for students who work or volunteer in a field related to their career major. Students are required to provide evidence that they are enrolled in a career program (e.g., education plan or coursework in a career/technical subject area). Students can earn one unit of credit for each 60 hours of unpaid volunteer time or 75 hours of paid work during the semester. Students can repeat Career/Technical Work Experience, combined with General Work Experience, or alone, up to a maximum of 16 units. Internship/job placement is not guaranteed. Lecture Hours: None Lab Hours: 2.07 Repeatable: Yes Grading: O  
Corequisite: Be employed or a volunteer at an approved work-site for the minimum number of hours per unit as stipulated for paid and unpaid status.

Advisory Level: Read: 3 Write: 3 Math: None  
Transfer Status: CSU Degree Applicable: AA/AS  
CSU GE: None IGETC: None District GE: None

**MACH 151A Advanced Lathe Practices 4 Units**

Students learn advanced and safe operation of the lathe, including work holding devices, single point threading, taper turning, knurling, and radius cutting. Students also learn to use calculation and measurement tools.

Lecture Hours: 3 Lab Hours: 3 Repeatable: No Grading: L  
Prerequisite: MACH 101 with C or better.  
Advisory Level: Read: 3 Write: 3 Math: 1  
Transfer Status: CSU Degree Applicable: AA/AS  
CSU GE: None IGETC: None District GE: None

**MACH 151B Advanced Milling Machine Practices 4 Units**

Students learn the theory and application of advanced machine tool processes, with focus on all milling machine operations. Students are instructed in the proper and safe operation of equipment and tools, advanced machine set-ups, indexing heads, rotary tables, and vertical shaping attachments. Special emphasis is placed on use of charts and reference data for calculations.

Lecture Hours: 3 Lab Hours: 3 Repeatable: No Grading: L  
Prerequisite: MACH 101 with C or better.  
Advisory Level: Read: 3 Write: 3 Math: 1  
Transfer Status: CSU Degree Applicable: AA/AS  
CSU GE: None IGETC: None District GE: None

**MACH 153A Operator/Programmer I 5 Units**

Students are introduced to Computerized Numerical Control (CNC) milling machines. Students are instructed in machining techniques with emphasis on terminology, pre-planning skills, and basic program writing for Manual Data Input (MDI) applications. Laboratory exercises will focus on CNC controls.

Lecture Hours: 3 Lab Hours: 6 Repeatable: No Grading: L  
Prerequisite: MACH 101 or MACH 120 or MACH 123 or MACH 126 or MACH 129; all with C or better  
Advisory Level: Read: 3 Write: 3 Math: 2  
Transfer Status: CSU Degree Applicable: AA/AS  
CSU GE: None IGETC: None District GE: None  
Credit by Exam: Yes

**MACH 153B Operator/Programmer II 5 Units**

This course is designed to develop the skills required of a Computer Numerical Control (CNC) Programmer/Operator. Students learn pre-planning, program generation, machine set-up, machine operation, and editing requirements with emphasis placed on CNC milling. The laboratory applications primarily focus on the use of Electronic International Agency (EIA) controls.

Lecture Hours: 3 Lab Hours: 6 Repeatable: No Grading: L  
Prerequisite: MACH 153A with C or better  
Advisory Level: Read: 3 Write: 3 Math: 1  
Transfer Status: CSU Degree Applicable: AA/AS  
CSU GE: None IGETC: None District GE: None  
Credit by Exam: Yes

**MACH 154 Introductory CAD/CAM Operations for Machinists and Operators 2 Units**

Students utilize latest versions of MasterCAM, using computers with various operating systems, to prepare CNC Computerized Numerical Control (CNC) Milling program files from supplied drawings and models. There will be an emphasis on terminology, planning techniques, and job documentation.

Lecture Hours: 1 Lab Hours: 3 Repeatable: No Grading: L  
Prerequisite: MACH 129 with C or better.  
Recommended: Completion of CA 020D, or fundamental computer skills and knowledge of Microsoft Office applications  
Advisory Level: Read: 3 Write: 3 Math: 2  
Transfer Status: CSU Degree Applicable: AA/AS  
CSU GE: None IGETC: None District GE: None  
Credit by Exam: Yes

**MACH 158 Advanced CAD/CAM Operations for Machinists and Operators 2 Units**

Students prepare Computerized Numerical Control (CNC) Turning/ Milling toolpaths of moderately complex parts using latest versions of MasterCAM or other parametric modeling and Computer-Aided Manufacturing (CAM) software. There will be an emphasis on speed, accuracy, planning, and job documentation.

Lecture Hours: 1 Lab Hours: 3 Repeatable: No Grading: L  
Prerequisite: MACH 154 with C or better.  
Advisory Level: Read: 3 Write: 3 Math: 1  
Transfer Status: CSU Degree Applicable: AA/AS  
CSU GE: None IGETC: None District GE: None  
Credit by Exam: Yes

**MACH 159 Introduction to CNC Programming Macros 2 Units**

The student will learn basic Fanuc macro structure and develop practical macro applications. The emphasis of the course will be on correct programming style and applications development for efficient and productive CNC usage. Students develop customized macro routines that can be used in the workplace.

Lecture Hours: 1 Lab Hours: 3 Repeatable: No Grading: L

Recommended: General knowledge of manual CNC programming (part program structure, G-codes and M-codes, as well as subprograms), CNC machining and setup.

Advisory Level: Read: 3 Write: 3 Math: None

Transfer Status: CSU Degree Applicable: AA/AS

CSU GE: None IGETC: None District GE: None

Credit by Exam: Yes

**MACH 160 Introduction to CNC Laser Applications 5 Units**

This introductory course will expose students to the basics of laser machine tools, safety, and applications such as cutting, drilling, welding, and marking.

Lecture Hours: 4 Lab Hours: 4 Repeatable: No Grading: L

Advisory Level: Read: 3 Write: 3 Math: 2

Transfer Status: CSU Degree Applicable: AA/AS

CSU GE: None IGETC: None District GE: None

**MACH 165 Mill Setups I 1.5 Units**

Students are introduced to mill setup skills used by setup machinists.

Students study the types and classes of jigs and fixtures and their application to sample simple parts. Students will demonstrate setting up the workholding on a machine tool, modelling the workholding and part in CAD/CAM. Students will also evaluate workholding costs.

Lecture Hours: 1 Lab Hours: 1.5 Repeatable: No Grading: L

Recommended: Mill operation experience is recommended for maximum course success

Advisory Level: Read: 3 Write: 3 Math: 2

Transfer Status: None Degree Applicable: AS

CSU GE: None IGETC: None District GE: None