

# ADVANCED MANUFACTURING

## Contact Information

### Division

Business and Technology

### Dean

Amy Schulz

### Associate Deans

Jill Alcorn, Darlene Jackson

### Division Office

B 3, Rocklin Campus

Gain hands-on skills to design, build and manufacture in the Computer Numeric Control (CNC) machining courses held in our state-of-the-art machining center. This program is affiliated with Gene Haas Foundation of Haas Automation, the largest CNC machine tool builder in the western world.

Learn the latest technologies and get exposure to the entire spectrum of manufacturing. Delve into computer modeling and creation. Design for technology applications on our brand-new Haas machines.

## Advanced Manufacturing Advisory Committee

- Roy Van Meter, TechnipFMC, Shingle Springs
- Dan Frank, Rocklin High School, Rocklin
- Shane Poole, Precision Fluid Controls, Rocklin
- Justin Carpenter, Springboard, Rancho Cordova
- Time Rice, Microform Precision, Sacramento
- Brian Roe, Roemotion Inc., Loomis
- Steve Prescott, Oasis Precision, Rocklin
- Tim Rickett, Kratos Defense, Sacramento
- Tim Rice, Micro Form Precision, Sacramento
- Tony Pinder, Oasis Precision, Rocklin
- Mark Dause, Kratos Defense, Sacramento
- Justin Carpenter, El Dorado Molds/Springboard, Rancho Cordova
- Herman Kaiser, Business Owner, Murphys
- Andy Baczynski, AB CNC, Rocklin
- Justin Coyle, Nevada Union High School, Grass Valley
- Scott Seacrest, Lincoln High School, Lincoln
- Clancy Cochran, Oasis Precision, Rocklin
- Matt Longo, Industry Professional, Rancho Cordova
- Austin Wilkinson, TechnipFMC, Shingle Springs
- Robert Greene, John F. Kennedy High School, Sacramento
- Sonia Susac, TECMA Company, Sacramento

## Degrees/Certificates

### Associate Degree

- Advanced Manufacturing (p. )
- **Certificate of Achievement**
- Advanced Manufacturing (p. )
- **Skills Certificate**
- Foundations of Modern Machining (p. 2)

## Advanced Manufacturing

### AS Degree

The Sierra College Advanced Manufacturing Program prepares students for C.N.C. machining and is also ideal for students who need to upgrade prior machine shop training to comply with the current needs of industry.

For the degree, students must fulfill the following major requirements with grades of "C" or better, complete a minimum of 60 degree-applicable semester units (12 of which must be completed at Sierra College) with a grade point average of at least 2.0 and complete one of the following three general education patterns:

- Sierra College Associate Degree Requirements (<http://catalog.sierracollege.edu/archive/2020-2021/student-resources/general-education/associate-degree-requirements>);
- California State University General Education Breadth pattern (<http://catalog.sierracollege.edu/archive/2020-2021/student-resources/general-education/california-state-university-general-education-breadth-requirements>);
- or Intersegmental General Education Transfer Curriculum (IGETC) (<http://catalog.sierracollege.edu/archive/2020-2021/student-resources/general-education/intersegmental-general-education-transfer-curriculum-igetc>).

### Required Courses:

Code	Title	Units
ADVM 0062	Introduction to Computer Aided Design and Manufacturing (CAD/CAM)	2.5
ADVM 0063	Design and 2-D Manufacturing of 3-D Objects	2
ADVM 0064	Computer-Aided 2D Design	3
ADVM 0066	CNC Machining Level 1	3
ADVM 0067	CNC Machining Level 2	3
ADVM 0068	Advanced Mill 4th and 5th Axis	3
DES 0001	Technical Drafting I	3
DES 0003D	Design for Additive Manufacturing - 3D Printing	3
WELD 0001A	Introductory Welding for Metalworking	2
<b>Select 4-7 units from the following:</b>		<b>4-7</b>
DES 0002	Technical Drafting II	
DES 0012	Geometric Dimensioning and Tolerancing	
MECH 0004	Fundamentals of Mechatronics	
WELD 0002A	Wire Feed Welding Processes - Career Path	
WELD 0003B	Gas Tungsten Arc Welding (TIG) - Career Path	
<b>Total Units</b>		<b>28.5-31.5</b>

## Advanced Manufacturing

### Certificate of Achievement

The Advanced Manufacturing certificate of achievement provides a comprehensive understanding of the skills necessary for success in the Advanced Manufacturing industry. This program is designed to enable the student to enter industry with problem-solving skills in design, production, planning, materials handling, quality control, inspection and programming with computer-aided controls. The student, upon the

successful completion of the program, will have job–entry skill and career advancement opportunities.

A certificate is designed to provide career technical skills; it is not equivalent to an associate degree.

**Required Courses:**

Code	Title	Units
ADVM 0062	Introduction to Computer Aided Design and Manufacturing (CAD/CAM)	2.5
ADVM 0063	Design and 2-D Manufacturing of 3-D Objects	2
ADVM 0064	Computer-Aided 2D Design	3
ADVM 0066	CNC Machining Level 1	3
ADVM 0067	CNC Machining Level 2	3
ADVM 0068	Advanced Mill 4th and 5th Axis	3
Total Units		16.5

## Foundations of Modern Machining

### Skills Certificate

Designed to give students modern manufacturing skills, knowledge, and abilities required to enter the workforce. Also intended for entrepreneurs seeking the fundamental skills to get started in modern manufacturing.

A certificate is designed to provide career technical skills; it is not equivalent to an associate degree.

**Required Courses:**

Code	Title	Units
ADVM 0062	Introduction to Computer Aided Design and Manufacturing (CAD/CAM)	2.5
ADVM 0066	CNC Machining Level 1	3
ADVM 0067	CNC Machining Level 2	3
Total Units		8.5

## Courses

Understanding course descriptions (<http://catalog.sierracollege.edu/archive/2020-2021/student-resources/course-information/understanding-course-descriptions>)

### ADVM 0062. Introduction to Computer Aided Design and Manufacturing (CAD/CAM)

*Units: 2.5*

Hours: 81 (27 lecture, 54 laboratory)

Introduction to CAD/CAM using Fusion 360. Covers practical on-the-job skills needed for precision machining. Students will learn skills needed to read and understand detailed drawings, create a process plan for machining parts, create 3D CAD files from 2D drawings, create 2D drawings from 3D models, plan and create CNC toolpaths and export G-code for manufacturing. (not transferable)

### ADVM 0063. Design and 2-D Manufacturing of 3-D Objects

*Units: 2*

Hours: 72 (18 lecture, 54 laboratory)

Students will learn the basic working principles of water jet cutting, laser cutting, laser engraving, plasma cutting, CNC and manual press brake machinery. Class projects will be modeled using computer software and then cut, engraved, or formed using the appropriate manufacturing process for the job. (not transferable)

### ADVM 0064. Computer-Aided 2D Design

*Units: 3*

Formerly known as WELD 64

Hours: 90 (36 lecture, 54 laboratory)

Study of Computer Numerically Controlled (CNC) cutting systems in the 2D world using industry standard hardware and development software. Topics include design principles, copyright, selection of materials, billing of materials and job estimating, basic G and M code commands, use of consumables, cut quality evaluation, and trouble-shooting techniques. (not transferable)

### ADVM 0066. CNC Machining Level 1

*Units: 3*

Formerly known as WELD 66

Advisory: Completion of ADVM 62 with grade of "C" or better

Hours: 90 (36 lecture, 54 laboratory)

Intermediate course making billet aluminum parts from start to finish using HAAS CNC milling machines. Fusion 360 will be used to model and program class assignments which are then posted to HAAS machines where students will learn how to set up and operate HAAS CNC vertical machining centers. After the parts have been machined, students will use common industry measuring and inspection techniques to insure their parts are in tolerance. (not transferable)

### ADVM 0067. CNC Machining Level 2

*Units: 3*

Formerly known as WELD 67

Prerequisite: Completion of ADVM 66 with grade of "C" or better

Hours: 90 (36 lecture, 54 laboratory)

Applications using multi-axis CNC machining. Developing complicated part geometry with Computer Aided Design (CAD), importing files, planning machine operations, and developing machine codes by Computer-Aided Machining (CAM) with multi-axis focus. Includes simulation modeling used to proof the assigned laboratory exercises and set-up for 3+2 and 4th and 5th axis operation of CNC machining centers. (not transferable)

### ADVM 0068. Advanced Mill 4th and 5th Axis

*Units: 3*

Prerequisite: Completion of ADVM 67 with grade of "C" or better

Hours: 90 (36 lecture, 54 laboratory)

Advanced CNC machining 4th and 5th axis Mill work. Developing complicated part geometry with Computer Aided Design (CAD), Post process CAM tool path development, planning machine operations, and developing machine codes and techniques for cost effectiveness. CNC Lathe operations. (CSU)

## Program Student Learning Outcomes (PSLOs)

- Create and analyze basic CAD drawing files for use in mechanical systems
- Evaluate an industrial process based on principles of Computer Integrated Manufacturing
- Identify necessary tools and describe tool offsets and part offsets for machining designed parts
- Design programing using CAM and basic G code to machine parts on a CNC turning center and CNC milling center that meet the part specification
- Describe and evaluate Geometric Dimensioning and tolerancing of parts from design