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Academic Year  
**2018 - 2019**

# Design and Manufacturing Technologies

Business, Computer Sciences and Applied Technologies Division  
Bldg. L1, Room L14  
408-864-8797

Counseling and Advising Center  
Student and Community Services Bldg., 2nd Fl.  
408-864-5400

Please visit the Counseling Center to apply for degrees and for academic planning assistance.

### Certificate of Achievement Requirements

Completion of all major courses with a "C" grade or higher, or with a "Pass" if the course was taken on a Pass/No Pass (P/NP) basis and the "Pass" is equal to a "C" grade or higher.

Note: A maximum of six (6) quarter units may be transferred from other academic institutions.

### Certificate of Achievement-Advanced Requirements

1. Completion of all major courses with a "C" grade or higher, or with a "Pass" if the course was taken on a Pass/No Pass (P/NP) basis and the "Pass" is equal to a "C" grade or higher.
2. Demonstrated proficiency in English and mathematics as evidenced by eligibility for EWRT 1A or EWRT 1AH or ESL 5 and eligibility for MATH 114.

Note: A maximum of 18 quarter units may be transferred from other academic institutions.

### A.A./A.S. Degree Requirements

1. Completion of all General Education (GE) requirements (32-43 quarter units) for the A.A./A.S. degree. GE units must be completed with a minimum 2.0 GPA ("C" average).
2. Completion of all major courses with a "C" grade or higher, or with a "Pass" if the course was taken on a Pass/No Pass (P/NP) basis and the "Pass" is equal to a "C" grade or higher. Major courses can also be used to satisfy GE requirements (except for Liberal Arts degrees).

Note: A maximum of 22 quarter units from other academic institutions may be applied toward the major.

3. Completion of a minimum of 90 degree-applicable quarter units (GE and major units included). All De Anza courses must be completed with a minimum 2.0 GPA ("C" average). All De Anza courses combined with courses transferred from other academic institutions must be completed with a minimum 2.0 GPA ("C" average).

Note: A minimum of 24 quarter units must be earned at De Anza College.

## Computer Aided Design - Mechanical

### Certificate of Achievement

Students pursuing De Anza College's Computer Aided Design - Mechanical Certificate of Achievement will receive an education in the fundamentals of CAD that combines the use of two types of design graphic software packages. Students will learn substantive job skills in Creo and SolidWorks CAD systems that will make them employable in industrial and mechanical engineering and design.

*Program Learning Outcomes - upon completion, students will be able to:*

- Solve basic and complex drafting and design application problems using industry standard two-dimensional and three-dimensional software and feature-based parametric design software.
- Apply the fundamentals of computer-aided drafting and design to disciplines such as architectural, mechanical and industrial design and engineering.

- Utilize industry standard microcomputer CAD software and the hardware, operating systems and peripherals used to facilitate it.
- Create engineering notes and scaled drawings using ASME and/or International Standards Organization (ISO) specifications.
- Satisfy a prospective employer with quality technical expertise in the use of two CAD tools (SolidWorks and Creo) at a level commensurate with entry- to mid-level usage in industry design and engineering.

1. Meet the requirements for this certificate level.
2. Complete the following.

DMT 52            Geometric Dimensioning and Tolerancing: CAD Applications            2

**Complete one course from the series:            4**  
DMT 60A - 60E series  
SolidWorks (Beginning) (4)

**Complete one course from the series:            4**  
DMT 61A - 61E series  
SolidWorks (Intermediate) (4)

**Complete one course from the series:            4**  
DMT 65A - 65E series  
Creo Parametric (Beginning) (4)

**Complete one course from the series:            4**  
DMT 66A - 66E series  
Creo Parametric (Intermediate) (4)

**Total Units Required ..... 18**

## CNC Machinist

### Certificate of Achievement

The Computer Numerical Control (CNC) Machinist Certificate of Achievement teaches students the fundamentals of conventional and CNC machine tools. Students learn how to set up safely and operate manual mills and lathes and construct word address programs for the setup and operation of CNC mills. Upon completion, students are prepared for employment in manufacturing facilities as setup persons, machine operators and production workers. This certificate is part of a career ladder. Students may also choose to complete a Certificate of Achievement-Advanced or A.S. degree.

*Program Learning Outcomes - upon completion, students will be able to:*

- Setup and operate conventional and CNC machines safely.
- Construct and inspect machined projects using conventional and CNC equipment.
- Construct word address programs to machine projects.

1. Meet the requirements for this certificate level.
2. Complete the following.

DMT 80	Introduction to Machining and CNC Processes	5
DMT 84A	Introduction to Computer-Aided Numerical Control (CNC) Programming and Operation; Mills	5
DMT 84B	Computer-Aided Numerical Control (CNC) Programming and Operation; Lathe Introduction, Advanced Mills	5
DMT 90	Print Reading and Machine Shop Calculations	4.5
<b>Total Units Required .....</b>		<b>19.5</b>

## CNC Machinist

### Certificate of Achievement-Advanced

#### A.S. Degree

The CNC Machinist Certificate of Achievement-Advanced and A.S. degree teaches students the fundamentals of CNC machine tools. Students learn safe setup, editing and operation of CNC equipment, including vertical and horizontal mills, lathes and rotary multi-axis components. Students are taught to dimension and inspect parts using various inspection methods and to analyze materials and processes used in manufacturing. Upon completion, students are prepared for employment in manufacturing facilities as CNC setup persons and machine operators.

*Program Learning Outcomes - upon completion, students will be able to:*

- Construct and inspect machined projects using CNC equipment with word address programs.
- Apply geometric dimensioning and tolerance standards to inspect drawings and inspect parts using a coordinate measuring machine.
- Differentiate and analyze the materials and processes used in manufacturing.
- Produce tool paths with constructed and imported geometry using Mastercam.
- Apply advanced machining skills by independently contracting projects.

### Certificate of Achievement-Advanced

1. Meet the requirements for this certificate level.
2. Complete the following.

DMT 80	Introduction to Machining and CNC Processes	5
DMT 84A	Introduction to Computer-Aided Numerical Control (CNC) Programming and Operation; Mills	5
DMT 84B	Computer-Aided Numerical Control (CNC) Programming and Operation; Lathe Introduction, Advanced Mills	5
DMT 84C	CNC Lathes-Horizontal Mill-4th Axis Rotary-Programming Operations	5
DMT 90	Print Reading and Machine Shop Calculations	4.5
DMT 92	Applied Geometric Inspection Dimensioning and Tolerancing (ASME Y14.5m); Coordinate Measuring Machines (CMM)	4
DMT 95	Manufacturing Materials and Processes	4

**Complete one course from the series:** **5**  
DMT 87D - 87E series  
CAD/CAM Based Computer Numerical Control Programming Using Mastercam (5)

**Complete one course from the series:** **5**  
DMT 87J - 87K series  
CAD/CAM Based CNC Surface Contouring Programming Using Mastercam (5)

**Complete one course from the series:** **5**  
DMT 87N - 87Q series  
CAD/CAM Based CNC 4 and 5 Axis Mill/Lathe Programming Using Mastercam (5)

**Complete one course from the series:** **5**  
DMT 89A - 89E series  
CAM Based CNC Multi-Axis Programming Using NX (5)

**Complete one course:** **2**  
DMT 77A Special Projects in Manufacturing and CNC/Mastercam Certification Level 1 (2)  
DMT 77B Special Projects in Manufacturing and CNC/Mastercam Certification Level 2 (2)  
DMT 77C Special Projects in Manufacturing and CNC/Mastercam Certification Level 3 (2)  
**Total Units Required .....****54.5**

#### A.S. Degree

*Major* Complete the Cert. of Achievement-Advanced requirements **54.5**  
*GE* General Education (32-43 units)  
*Electives* Elective courses required when major units plus GE units total is less than 90  
**Total Units Required .....****90**

## CNC Programming - CAD/CAM

### Certificate of Achievement

The CNC Programming - CAD/CAM Certificate of Achievement teaches students 2-D, 3-D, lathe and multi-axis machine tool programming. Students learn to construct geometry, select tools and produce and verify tool paths. Upon completion, students are prepared for employment as entry-level programmers in prototype and production manufacturing facilities. This certificate is part of a career ladder. Students may also choose to complete a Certificate of Achievement-Advanced or A.S. degree in CNC Machinist.

*Program Learning Outcomes - upon completion, students will be able to:*

- Design and construct 2-D, 3-D, lathe, horizontal and multi-axis part geometry.
- Select tools and produce tool paths with constructed and imported geometry.
- Verify tool paths and create word address programs for CNC machines.

1. Meet the requirements for this certificate level.
2. Complete the following.

<b>Complete one course from the series:</b>	<b>5</b>
DMT 87D - 87E series	
CAD/CAM Based Computer Numerical Control Programming Using Mastercam (5)	
<b>Complete one course from the series:</b>	<b>5</b>
DMT 87J - 87K series	
CAD/CAM Based CNC Surface Contouring Programming Using Mastercam (5)	
<b>Complete one course from the series:</b>	<b>5</b>
DMT 87N - 87Q series	
CAD/CAM Based CNC 4 and 5 Axis Mill/Lathe Programming Using Mastercam (5)	
<b>Complete one course from the series:</b>	<b>5</b>
DMT 89A - 89E series	
CAM Based CNC Multi-Axis Programming Using NX (5)	
<b>Total Units Required .....</b>	<b>20</b>

## CNC Research and Development Machinist Certificate of Achievement-Advanced

### A.S. Degree

The Certificate of Achievement-Advanced and A.S. degree teaches students the fundamentals of conventional and CNC machine tools. Students learn to set up safely and operate manual mills, lathes, surface grinders and CNC equipment, including vertical and horizontal mills, lathes and rotary multi-axis components. They also learn to produce word address programs with CAD/CAM software. Students are taught to dimension and inspect parts using various inspection methods and to analyze materials and processes used in manufacturing. Upon completion, students are prepared for employment working closely with engineers in a research and development environment.

*Program Learning Outcomes - upon completion, students will be able to:*

- Construct and inspect machined projects using conventional and CNC equipment using word address programs.
- Apply geometric dimensioning and tolerance standards to inspect drawings and inspect parts using a coordinate measuring machine.
- Differentiate and analyze the materials and processes used in manufacturing.
- Analyze, construct and inspect diagrams to repair physical and electrical components.
- Produce tool paths with constructed and imported geometry using Mastercam.

### Certificate of Achievement-Advanced

1. Meet the requirements for this certificate level.
2. Complete the following.

DMT 80	Introduction to Machining and CNC Processes	5
DMT 82	Machining Practices Using Conventional Machine Tools, Tool Design, Abrasive Machining	5

DMT 84A	Introduction to Computer-Aided Numerical Control (CNC) Programming and Operation; Mills	5
DMT 84B	Computer-Aided Numerical Control (CNC) Programming and Operation; Lathe Introduction, Advanced Mills	5
DMT 84C	CNC Lathes-Horizontal Mill-4th Axis Rotary-Programming Operations	5
DMT 90	Print Reading and Machine Shop Calculations	4.5
DMT 92	Applied Geometric Inspection Dimensioning and Tolerancing (ASME Y14.5m); Coordinate Measuring Machines (CMM)	4
DMT 95	Manufacturing Materials and Processes	4
<b>Complete one course from the series:</b>	<b>5</b>	
DMT 87D - 87E series		
CAD/CAM Based Computer Numerical Control Programming Using Mastercam (5)		
<b>Complete one course from the series:</b>	<b>5</b>	
DMT 87J - 87K series		
CAD/CAM Based CNC Surface Contouring Programming Using Mastercam (5)		

<b>Complete one course from the series:</b>	<b>5</b>
DMT 87N - 87Q series	
CAD/CAM Based CNC 4 and 5 Axis Mill/Lathe Programming Using Mastercam (5)	
<b>Complete four units:</b>	<b>4</b>
DMT 77D	Special Projects in Manufacturing and CNC/NIMS Level 1 (2)
DMT 77E	Special Projects in Manufacturing and CNC/NIMS Level 2 (2)
DMT 77F	Special Projects in Manufacturing and CNC/NIMS Level 3 (2)
<b>Total Units Required .....</b>	<b>56.5</b>

### A.S. Degree

<i>Major</i>	<i>Complete the Cert. of Achievement-Advanced requirements</i>	56.5
<i>GE</i>	<i>General Education (32-43 units)</i>	
<i>Electives</i>	<i>Elective courses required when major units plus GE units total is less than 90</i>	
<b>Total Units Required .....</b>	<b>90</b>	

## Product Model Making

### Certificate of Achievement-Advanced

#### A.S. Degree

Students in the Certificate of Achievement-Advanced and A.S. degree are taught the fundamentals of Product Model Making. Students learn the safe setup of CNC equipment, how to design and construct three-dimensional objects using CAD/CAM software and how to analyze materials and processes used in prototype model making. Upon completion, students are prepared for employment working in design-stage product development and prototype and model making environments.

*Program Learning Outcomes - upon completion, students will be able to:*

- Construct and inspect machined projects using conventional and CNC equipment that uses word address programs.
- Design and construct three-dimensional objects.
- Create part geometry using SolidWorks or Creo/Pro Engineer CAD software.
- Differentiate and analyze the materials and processes used in manufacturing.
- Produce tool paths with constructed and imported geometry using Mastercam.

**Certificate of Achievement-Advanced**

1. Meet the requirements for this certificate level.
2. Complete the following.

ARTS 10A	Three-Dimensional Design	4
ARTS 10B	Intermediate Three-Dimensional Design	4
DMT 80	Introduction to Machining and CNC Processes	5
DMT 84A	Introduction to Computer-Aided Numerical Control (CNC) Programming and Operation; Mills	5
DMT 84B	Computer-Aided Numerical Control (CNC) Programming and Operation; Lathe Introduction, Advanced Mills	5
DMT 95	Manufacturing Materials and Processes	4

<b>Complete one course from either series:</b>	<b>4</b>
DMT 60A - 60E series SolidWorks (Beginning) (4)	
DMT 65A - 65E series Creo Parametric (Beginning) (4)	

<b>Complete one course from the series:</b>	<b>5</b>
DMT 87D - 87E series CAD/CAM Based Computer Numerical Control Programming Using Mastercam (5)	

<b>Complete one course from the series:</b>	<b>5</b>
DMT 87J - 87K series CAD/CAM Based CNC Surface Contouring Programming Using Mastercam (5)	

<b>Complete one course from the series:</b>	<b>5</b>
DMT 87N - 87Q series CAD/CAM Based CNC 4 and 5 Axis Mill/Lathe Programming Using Mastercam (5)	
<b>Total Units Required .....</b>	<b>46</b>

**A.S. Degree**

<i>Major</i>	<i>Complete the Cert. of Achievement-Advanced requirements</i>	46
<i>GE</i>	<i>General Education (32-43 units)</i>	
<i>Electives</i>	<i>Elective courses required when major units plus GE units total is less than 90</i>	
<b>Total Units Required .....</b>		<b>90</b>

**Quality Control Technician**

**Certificate of Achievement**

The Quality Control Technician Certificate of Achievement prepares students in the fundamentals of machining techniques, dimensional metrology, interpretation of multi-view engineering prints and applied geometric inspection dimensioning and tolerancing (ASME Y14.5m). Students also learn the correct operation of coordinate measuring machines (CMM) and the principles of manufacturing quality control and associated standards. Students in the Quality Control Technician program are instructed on how to inspect parts using various inspection methods; interpret drawings used in manufacturing; and record, analyze and document findings using various quality assurance procedures. Program students also learn the safe setup and operation of CMM and related measuring instruments. Upon completion of the certificate requirements, students are prepared for employment in manufacturing facilities as quality control inspectors and technicians.

*Program Learning Outcomes - upon completion, students will be able to:*

- Analyze, construct and inspect assigned machined projects using the introductory principles of machining.
- Demonstrate the ability to interpret multi-view drawings and prints.
- Demonstrate the ability to utilize common gauges, measurement instruments and calibration tools.
- Apply geometric dimensioning and tolerancing standards to interpret drawings and inspect manufactured parts.
- Demonstrate basic operation of the coordinate measuring machine (CMM) to inspect manufactured parts.
- Demonstrate a working knowledge of calibration systems, inspection methodology, statistical process control indices and quality sampling techniques.

1. Meet the requirements for this certificate level.
2. Complete the following.

DMT 80	Introduction to Machining and CNC Processes	5
DMT 90	Print Reading and Machine Shop Calculations	4.5
DMT 91	Dimensional Metrology	4.5
DMT 92	Applied Geometric Inspection Dimensioning and Tolerancing (ASME Y14.5m); Coordinate Measuring Machines (CMM)	4
DMT 93	Introduction to Quality Assurance	4
<b>Total Units Required .....</b>		<b>22</b>