DIABLO VALLEY COLLEGE  CATALOG 2021-2022

any updates to this document can be found in the addendum at www.dvc.edu/communication/catalog

Engineering technology

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**ENGINEERING TECHNOLOGY - ENGTC**

Despina Prapavessi, Dean  
Mathematics and Engineering Division  
Mathematics Building, Room 267

Possible career opportunities

Career options in engineering technology include civil engineering technicians, surveying and mapping technicians (cartography), architectural and civil drafters, and mechanical engineering technicians. Engineering technicians may work as computer-aided design drafters, engineering aides, land surveyors, field assistants, planning technicians and technical sales people.

Associate in science degree

Civil design drafting technology

Students completing the program will be able to...

A. use technical drafting principles to develop technical drawings.  
B. interpret construction blueprints.  
C. use geometric construction and descriptive geometry to solve geometric problems.  
D. create 2-dimensional and 3-dimensional computer aided drawings (CAD).  
E. interpret global positioning data.  
F. measure land forms using ground surveying equipment.  
G. apply trigonometry to math problems.  
H. apply the basic laws of physics to everyday situations.

The associate in science degree in civil design drafting technology provides students with the technical and analytical skills needed for employment in the field of civil engineering drafting. Through both academic and laboratory study, students gain the practical skills needed for entry into the job market. For example, civil drafters may work on plans for major construction projects such as dams, roads, bridges, and sewage systems; or prepare, interpret and revise topographic and/or relief maps using computer-aided drafting (CAD).

To earn the degree, students must complete each course used to meet a major requirement with a “C” grade or higher and complete general education requirements as listed in the catalog. Students who wish to transfer should consult with program faculty and college counselors to ensure that the requirements for transfer to appropriate institutions are met. Certain courses may satisfy both major and general education requirements; however, the units are only counted once.

major requirements:  

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<tr>
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<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>CONST-114</td>
<td>Print Reading</td>
<td>3</td>
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<tr>
<td>ENGIN-121</td>
<td>Engineering Drawing/Descriptive Geometry</td>
<td>3</td>
</tr>
<tr>
<td>PHYS-110</td>
<td>Elementary Physics</td>
<td>3</td>
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plus at least 3 units from:

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<tr>
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<tbody>
<tr>
<td>ENGTC-111</td>
<td>Mathematics for Technicians</td>
<td>3</td>
</tr>
<tr>
<td>MATH-121</td>
<td>Plane Trigonometry</td>
<td>3</td>
</tr>
<tr>
<td>MATH-191</td>
<td>Pre-Calculus</td>
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plus at least 3 units from:

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<tbody>
<tr>
<td>ARCHI-119</td>
<td>Introduction to Technical Drawing</td>
<td>3</td>
</tr>
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<tbody>
<tr>
<td>ARCHI-126</td>
<td>Computer Aided Design and Drafting - AutoCAD</td>
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</tr>
<tr>
<td>ENGTC-126</td>
<td>Computer Aided Design and Drafting - AutoCAD</td>
<td>3</td>
</tr>
</tbody>
</table>

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<tr>
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<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>ENGTC-226</td>
<td>Computer Aided Drafting Design, Advanced Concepts - AutoCAD</td>
<td>3</td>
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plus at least 3 units from:

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>GEOG-124</td>
<td>Thinking and Communicating Geospatially</td>
<td>3</td>
</tr>
<tr>
<td>GEOG-129</td>
<td>Field Data Acquisition and Management</td>
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plus at least 6 units from:

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<td>Plane Surveying</td>
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<tr>
<td>ENGIN-140</td>
<td>Plane Surveying</td>
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</tr>
<tr>
<td>ENGTC-123</td>
<td>Principles of Civil Drafting</td>
<td>3</td>
</tr>
<tr>
<td>ENGTC-125</td>
<td>Introduction to Geographic Information Systems (GIS)</td>
<td>3</td>
</tr>
<tr>
<td>GEOG-126</td>
<td>Advanced Geographic Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>GEOG-160</td>
<td>Introduction to Remote Sensing</td>
<td>4</td>
</tr>
<tr>
<td>GEOG-182</td>
<td>Map Design and Visualization</td>
<td>3</td>
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</table>

total minimum units for the major  

30

Associate in science degree

Machining for mechanical engineering technology

Students completing the program will be able to...

A. read the drawing for an object and visualize the geometry.  
B. choose the correct manufacturing method for the object.  
C. manufacture an object from a given drawing using machine tools.  
D. use algebra, spreadsheets and measurement data to produce QC statistics.  
E. verify that products meet the design criteria.  
F. design and prototype mechanical parts under the supervision of engineers.  
G. use computer integrated manufacturing (CIM) and computer numerical control (CNC) software for automation of manufacturing.

**DIABLO VALLEY COLLEGE  CATALOG 2021-2022**  
PROGRAM AND COURSE DESCRIPTIONS
Engineering technology

The associate of science degree in machining for mechanical engineering technology is offered to prepare students with the required aptitude and skills to enter the workforce as entry-level machinists, tool and die makers, or mold makers. Students will be prepared for careers that are highly in demand for aerospace, medical, electronic, high tech, and automotive and transport industries. Graduates of this program will be well equipped to continue their career advancement as engineers, product developers, prototype/model builders, production machinist, or electro-mechanical maintenance and repair specialists.

Students completing this program will develop familiarity with lathes, mills, drill presses, and precision measuring. They will also be introduced to the concepts of computer numerical control (CNC) machines and 3D (additive) manufacturing processes, geometric dimension and tolerance (GD&T), and modern technical drawing (CAD) techniques.

The DVC machining for mechanical engineering technology major is not intended for transfer. Option 1 (DVC General Education) is advised for students who do not intend to transfer. Students who intend to transfer to a four-year baccalaureate program should consult with a counselor regarding specific major preparation requirements at the transfer institution of their choice. Students who intend to transfer are advised to select General Education Option 2 (IGETC) or Option 3 (CSU GE).

Students must complete each of the courses required for the major with a “C” grade or higher. Students may not take a pass/no pass option for major courses. Certain courses may satisfy both major and general education requirements; however, the units are only counted once.

**major requirements:**

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<td>Computer Aided Design and Drafting-AutoCAD</td>
<td>3</td>
</tr>
<tr>
<td>ENGTC-129</td>
<td>Product Design I Using Solidworks</td>
<td>3</td>
</tr>
<tr>
<td>ENGTC-160</td>
<td>Introduction to Industrial and Manufacturing Engineering</td>
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</tr>
<tr>
<td>ENGTC-162</td>
<td>Geometric Dimensioning and Tolerancing</td>
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<td>ENGTC-165</td>
<td>Machining and Manufacturing I</td>
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<td>ENGTC-166</td>
<td>Machining and Manufacturing II</td>
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</tr>
<tr>
<td>ENGTC-168</td>
<td>Introduction to Computer Numerical Control</td>
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</table>

**plus at least 3 units from:**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ENGTC-111</td>
<td>Mathematics for Technicians</td>
<td>3</td>
</tr>
<tr>
<td>MATH-119</td>
<td>Beginning and Intermediate Algebra</td>
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</tr>
<tr>
<td>MATH-121</td>
<td>Plane Trigonometry</td>
<td>3</td>
</tr>
<tr>
<td>MATH-191</td>
<td>Pre-Calculus</td>
<td>5</td>
</tr>
<tr>
<td>MATH-192</td>
<td>Analytic Geometry and Calculus I</td>
<td>5</td>
</tr>
</tbody>
</table>

**total minimum units for the major** 25

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**Associate in science degree**

**mTECH - Industrial maintenance machinist/mechanic**

Students completing the program will be able to...

A. discuss the role of the industrial maintenance machinist/mechanic in shop and field maintenance safety.
B. interpret blueprints and technical drawings for parts manufacturing and maintenance repair operations
C. grind high speed steel tool bits for general purpose turning and threading.
D. cut multiple lead and acme threads on a lathe.
E. use the vertical milling machine to drill holes, index, bore hole to a specified diameter and depth, mill surfaces and edges, and use an indicator to reference work.
F. replace a single mechanical seal in a centrifugal pump.
G. align a pump shaft to a motor to a specified tolerance.

This program prepares students for jobs in the manufacturing industry including industrial machinery mechanics, maintenance specialists or technicians, and machinery maintenance workers in industries including chemical, refinery, and public works. These jobs involve repairing, installing, adjusting, or maintaining industrial production and processing machinery or refinery and pipeline distribution systems. The labor market for these high-wage occupations in the Bay Area is strong. Graduates of this program will gain skills and knowledge in areas that include machining, industrial hydraulics and pneumatics, shop and field maintenance, basic electricity, technical drawing, basic drafting, and applied mathematics. Students are advised to meet with a counselor or program advisor to develop an educational plan that meets their needs.

The DVC mTECH major is not intended for transfer. Option 1 (DVC General Education) is advised for students who do not intend to transfer. Students who intend to transfer to a four-year baccalaureate program should consult with a counselor regarding specific major preparation requirements at the transfer institution of their choice. Students who intend to transfer are advised to select General Education Option 2 (IGETC) or Option 3 (CSU GE).

Students must complete each of the courses required for the major with a “C” grade or higher. Students may not take a pass/no pass option for major courses. Certain courses may satisfy both major and general education requirements; however, the units are only counted once.

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<tbody>
<tr>
<td>CONST-110</td>
<td>Occupational Safety</td>
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<tr>
<td>ELECT-110</td>
<td>Survey of Electricity</td>
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</tr>
<tr>
<td>ENGTC-119</td>
<td>Introduction to Technical Drawing</td>
<td>3</td>
</tr>
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<td>ENGTC-165</td>
<td>Machining and Manufacturing I</td>
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</tr>
<tr>
<td>ENGTC-166</td>
<td>Machining and Manufacturing II</td>
<td>3</td>
</tr>
<tr>
<td>ENGTC-175</td>
<td>Hydraulic and Pneumatic Systems and Components</td>
<td>3</td>
</tr>
<tr>
<td>ENGTC-176</td>
<td>Mechanical Systems and Components</td>
<td>3</td>
</tr>
</tbody>
</table>
Certificate of achievement
Civil design drafting technology

Students completing the program will be able to...

A. apply civil drafting principles to interpret and develop civil engineering maps.
B. interpret construction blueprints.
C. create 2-dimensional and 3-dimensional computer aided drawings (CAD).
D. interpret global positioning data.
E. measure land forms using ground surveying equipment.
F. use general computer software such as Microsoft Word and Excel.
G. apply trigonometry to math problems.

This certificate program prepares students for further study or an entry-level training position in jobs requiring them to prepare and revise technical drawings used in civil engineering and surveying.

To earn a certificate of achievement, students must complete each of the required courses with a “C” grade or higher. Some courses are not offered every term so please consult with the program director for assistance in scheduling classes.

required courses:  units
CONST-114  Print Reading ................................................. 3
ENGIN-121*  Engineering Drawing /Descriptive Geometry .......... 3
PHYS-110  Elementary Physics ........................................... 3

plus at least 3 units from:
ENGTC-111  Mathematics for Technicians .......................... 3
MATH-121  Plane Trigonometry ........................................... 3
MATH-191  Pre-Calculus ...................................................... 5

plus at least 3 units from:
ARCHI-119  Introduction to Technical Drawing..................... 3
ENGTC-119  Introduction to Technical Drawing..................... 3

plus at least 3 units from:
ARCHI-126  Computer Aided Design and Drafting - AutoCAD .... 3
ENGTC-126  Computer Aided Design and Drafting - AutoCAD .... 3

Certificate of achievement
Civil drafting, CAD

Students completing the program will be able to...

A. use technical drafting principles to develop technical drawings.
B. interpret construction blueprints.
C. use geometric construction and descriptive geometry to solve geometric problems.
D. create 2-dimensional and 3-dimensional computer aided drawings (CAD).
E. interpret global positioning data.
F. measure land forms using ground surveying equipment.
G. apply trigonometry to math problems.

This certificate program prepares students for entry level work as a civil drafter. Drafters work under the supervision of civil or structural engineers, architects, and/or surveyors as support staff in jobs requiring them to prepare, interpret, and revise technical drawings, or gather and categorize field data. Engineering technicians work as support staff in field, laboratory and/or office environments.

To earn a certificate of achievement, students must complete each of the required courses with a “C” grade or higher. Some courses are not offered every term so please consult with the program director for assistance in scheduling classes.

required courses:  units
CONST-114  Print Reading ................................................. 3
ENGIN-121*  Engineering Drawing /Descriptive Geometry .......... 3

plus at least 3 units from:
ENGTC-111  Mathematics for Technicians .......................... 3
MATH-121  Plane Trigonometry ........................................... 3
MATH-191  Pre-Calculus ...................................................... 5

plus at least 3 units from:
ARCHI-119  Introduction to Technical Drawing..................... 3
ENGTC-119  Introduction to Technical Drawing..................... 3

plus at least 3 units from:
ARCHI-126  Computer Aided Design and Drafting - AutoCAD .... 3
ENGTC-126  Computer Aided Design and Drafting - AutoCAD .... 3
plus at least 3 units from:
ENGTC-226  Computer Aided Drafting Design, Advanced Concepts - AutoCAD ...............  3

plus at least 3 units from:
GEOG-124  Thinking and Communicating Geospatially .......  3
GEOG-129  Field Data Acquisition and Management ..........  3

plus at least 6 units from:
ARCHI-135  Digital Tools for Design .......................  3
ARCHI-136  Digital Tools for Architecture ..................  3
CONST-116*  Plane Surveying .............................  4
ENGIN-140*  Plane Surveying .............................  4
ENGTC-123  Principles of Civil Drafting ....................  3
GEOG-125  Introduction to Geographic Information Systems (GIS) ..................  3
GEOG-126  Advanced Geographic Information Systems ...  3
GEOG-160  Introduction to Remote Sensing ..................  3
GEOG-162  Map Design and Visualization .....................  3

total minimum required units 27

*Certain courses required for this certificate have recommended or prerequisite coursework that could add additional units.

Certificate of achievement
Machining for mechanical engineering technology

Students completing the program will be able to...
A. read the drawing for an object and visualize the geometry.
B. choose the correct manufacturing method for the object.
C. manufacture an object from a given drawing using machine tools.
D. use algebra, spreadsheets and measurement data to produce QC statistics.
E. verify that products meet the design criteria.
F. design and prototype mechanical parts under the supervision of engineers.
G. use computer integrated manufacturing (CIM) and computer numerical control (CNC) software for automation of manufacturing.

The certificate of achievement in machining for mechanical engineering technology is offered to prepare students with the required aptitude and skills to enter the workforce as entry-level machinists, tool and die makers, or mold makers. Students will be prepared for careers that are highly in demand for aerospace, medical, electronic, high tech, and automotive and transport industries. Graduates of this program will be well equipped to continue their career advancement as engineers, product developers, prototype/model builders, production machinist, or electro-mechanical maintenance and repair specialists.

Students completing this program will develop familiarity with lathes, mills, drill presses, and precision measuring. They will also be introduced to the concepts of computer numerical control (CNC) machines and 3D (additive) manufacturing processes, geometric dimension and tolerance (GD&T), and modern technical drawing (CAD) techniques.

Students must complete each of the courses required for the certificate with a “C” grade or higher. Students may not take a pass/no pass option for required courses.

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<td>ENGTC-166</td>
<td>Machining and Manufacturing II</td>
<td>3</td>
</tr>
<tr>
<td>ENGTC-168</td>
<td>Introduction to Computer Numerical Control</td>
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plus at least 3 units from:

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Certificate of achievement
mTECH - Industrial maintenance machinist/mechanic

Students completing the program will be able to...
A. discuss the role of the industrial maintenance machinist/mechanic in shop and field maintenance safety.
B. interpret blueprints and technical drawings for parts manufacturing and maintenance repair operations.
C. grind high speed steel tool bits for general purpose turning and threading.
D. cut multiple lead and acme threads on a lathe.
E. use the vertical milling machine to drill holes, index, bore hole to a specified diameter and depth, mill surfaces and edges, and use an indicator to reference work.
F. replace a single mechanical seal in a centrifugal pump.
G. align a pump shaft to a motor to a specified tolerance.

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Graduates of this program will gain skills and knowledge in areas that include machining, industrial hydraulics and pneumatics, shop and field maintenance, basic electricity, technical drawing, basic drafting, and applied mathematics. Students are advised to meet with a counselor or program advisor to develop an educational plan that meets their needs.

Students must complete each course used to meet a program requirement with a “C” grade or higher. Students may not take a pass/no pass option for certificate courses.
required courses:                      units
CONST-110  Occupational Safety ......................2
ELECT-110  Survey of Electricity......................2
ENGTTC-119 Introduction to Technical Drawing.........3
ENGTTC-165  Machining and Manufacturing I...........3
ENGTTC-166  Machining and Manufacturing II..........3
ENGTTC-175  Hydraulic and Pneumatic Systems and
Components ...........................................3
ENGTTC-176  Mechanical Systems and Components .....3

plus 0-5 units from:
ENGTTC-111  Mathematics for Technicians ..............3
MATH-119    Beginning and Intermediate Algebra.......4
MATH-121    Plane Trigonometry........................3
MATH-191    Pre-Calculus ................................5
MATH-192    Analytic Geometry and Calculus I .......5

total minimum required units  19

Certificate of accomplishment
Computer aided drafting and digital media
for architecture, industrial design and
engineering
Students completing the program will be able to...
A. create 2-dimensional and 3-dimensional computer aided
drawings (CAD).
B. interpret construction blueprints and architectural plans.
C. calculate data collected from land surveying.
D. interpret simple technical drawings.
E. construct 3-Dimensional models using parametric soft-
ware.

Drafters make drawings and plans to specify dimensions,
materials and processes used in the making of a final
product. These drawings are guidelines for the workers
who will actually build or make whatever is being produced.
Drafters also make drawings from blueprints, engineering
sketches, photos and other sources which show how parts
and other objects work, their relation to one another, and
how they will be put together. Drafters create drawings
and plans to specify dimensions, materials and processes
for the finished product. Such drawings and plans provide
guidance to those working to complete the finished product.
Drafters also render drawings from blueprints, sketches,
photos and other sources which show the interplay of
components and their relationships to one another, and to
provide guidance for final assembly.

To earn a certificate of accomplishment, students must com-
plete each of the required courses with a “C” grade or high-
er. Some courses are not offered every term. Consult with
the program director for assistance in scheduling classes.

required courses:                      units
complete 3 units from:
ARCHI-126  Computer Aided Design and Drafting -
AutoCAD.............................................3
ENGTTC-126 Computer Aided Design and Drafting -
AutoCAD.............................................3

plus at least 3 units from:
ARCHI-226  Computer Aided Drafting Design, Advanced
Concepts - AutoCAD............................3
ENGTTC-226 Computer Aided Drafting Design, Advanced
Concepts - AutoCAD............................3

plus at least 3 units from:
ARCHI-119  Introduction to Technical Drawing..........3
ARCHI-120  Introduction to Architecture and
Environmental Design........................3
CONST-114  Print Reading ................................3
ENGTTC-119  Introduction to Technical Drafting........3

Certificate of accomplishment
Pre-engineering technology
Students completing the program will be able to...
A. develop technical drawings with detailed dimensions us-
ing hand drafting line work and lettering.
B. create 2-dimensional computer aided design (CAD) draw-
ings and 3-dimensional computer models.
C. safely operate hand and power tools.
D. use measuring devices to calculate and verify tolerances
for metal, wood, and plastics parts.
E. apply prototyping techniques for engineering, product
design, and manufacturing.

The certificate of accomplishment in pre-engineering tech-
nology provides students with the foundation of skills
required to pursue a degree or certificate in mTECH (indus-
trial machine maintenance), manufacturing, industrial
design, or electro-mechanical. The courses provide students
with skills in technical drawing, computer aided design
(CAD), and traditional shop tools.

Students create detailed product specifications and gain
knowledge required to safely operate shop tools. Concepts in
technical drawing, computer-aided design, and hand draft-
ing will be included. In addition, students use a variety of
measuring devices and safely operate traditional machinery
including drills, saws and mechanical tools. Completion of
the foundation courses and prepare students to transition
into technical design, rapid prototyping, computer numeri-
cal control (CNC) machining and manufacturing.

To earn a certificate of accomplishment, students must com-
plete each course used to meet a certificate requirement with
a “C” grade or higher and maintain an overall GPA of 2.5 or
higher in the coursework required for the certificate.

required courses:                      units
complete 3 units from:
ARCHI-135  Digital Tools for Design..................3
ARCHI-136  Digital Tools for Architecture ...........3
ARCHI-160  3D Modeling and Animation I ............3
ENGTTC-129 Product Design I Using SolidWorks ......3
GEOG-125  Introduction to Geographic Information
Systems (GIS) .......................................3
IDSGN-120  Introduction to Industrial and
Product Design ....................................3

total minimum required units  12
ENGTC-111  Mathematics for Technicians
3 units  LR
•  DVC GE: 1C
•  54 hours lecture per term
•  Prerequisite: Placement into MATH-121; or MATH-085 or MATH 085SP; or MATH-090 or MATH-090E or MATH-090SP or assessment process; or equivalent

This course is a study of mathematical topics used for technical applications in the workplace. Topics include an introduction to units of measurement, mathematical operations with application to technical problems, algebraic operations and concepts in geometry and trigonometry. An introduction to coordinate spaces and systems and their application to technical problems in the field are also covered. The calculation of surface areas and volumes are presented in context with problems encountered in technical and design fields. CSU

ENGTC-119  Introduction to Technical Drawing
3 units  SC
•  36 hours lecture/72 hours laboratory per term
•  Note: Same as ARCHI-119. For students with no previous drafting experience. Credit by examination option available.

This course presents an introduction to technical drawing. Topics include technical lettering and line work, geometric constructions, sketching and shape description, orthographic projection, dimensioning, section views, and auxiliary views. Students will gain experience using computers to produce technical drawings, utilizing 3D modeling and orthographic computer aided design (CAD) drafting. An introduction to computer numerical control (CNC) prototyping and 3D printing is also covered. CSU, UC (credit limits may apply to UC - see counselor)

ENGTC-123  Principles of Civil Drafting
3 units  LR
•  36 hours lecture/72 hours laboratory per term
•  Recommended: ENGTC-111 (may be taken concurrently), ENGTC-119 and ENGTC-126 or equivalents

Introduction to civil drafting as it relates to topographic maps and charts. Course covers reading, interpreting and constructing a variety of maps used for civil engineering such as surveyor maps, plat and plot maps, and aerial maps. Students will use both manual and computer methods for drafting of maps. CSU

ENGTC-126  Computer Aided Design and Drafting - AutoCAD
3 units  SC
•  36 hours lecture/72 hours laboratory per term
•  Recommended: ENGTC-119 or ARCHI-119 or equivalent
•  Note: Same as ARCHI-126. Students may petition to repeat this course when software or hardware is changed. Only the first course completed will be applied toward a degree or certificate requirement. Units for both courses will apply towards the 60 units required for the degree. Credit by examination option available.

This introductory course covers the fundamentals of AutoCAD, and its application to the creation of technical drawings. Hands-on training utilizing a comprehensive overview of the software package and its applications to technical drafting is emphasized. CSU, UC (credit limits may apply to UC - see counselor)

ENGTC-129  Product Design I Using SolidWorks
3 units  SC
•  36 hours lecture/72 hours laboratory per term
•  Recommended: ARCHI-119 or ENGTC-119 or equivalent
•  Note: Students may petition to repeat this course when software or hardware is changed. Only the first course completed will be applied toward a degree or certificate requirement. Units for both courses will apply towards the 60 units required for the degree. Credit by examination option available.

This course introduces students to product design using SolidWorks. Students use the functions of SolidWorks and apply these functions within the product design process. CSU

ENGTC-160  Introduction to Industrial and Manufacturing Engineering
3 units  LR
•  54 hours lecture per term

This course presents the methods and processes involved in the manufacturing of a variety of products in various materials. Topics include an introduction to various materials and their properties, types of machinery used in manufacturing, methods of casting and shaping materials along with other industrial and technical processes. An introductory overview of engineering drawing standards and quality assurance is also covered. CSU, UC

ENGTC-162  Geometric Dimensioning and Tolerancing
1 unit  LR
•  9 hours lecture/27 hours laboratory per term
•  Recommended: ENGTC-111 or equivalent

This course will present the principles of geometric dimensioning and tolerancing (GDT). Topics include GDT symbols, datum planes, material conditions, orientation, location, profile and runout tolerances. Laboratory assignments emphasize measurement using granite tables and pin and height gauges. CSU, UC
ENGTC-165  Machining and Manufacturing I
3 units  LR
• 36 hours lecture/72 hours laboratory per term
• Recommended: ENGTC-119 or ARCHI-119 or equivalent
This course introduces practical and theoretical aspects of machine tool processes. Topics include basic blueprint interpretation, use of hand tools, measuring instruments and gauges, layout, inspection techniques and metals identification. Setup and operation of drill presses, band saw, grinders, lathes, milling, and computer-numerical control (CNC) machines will also be covered. CSU

ENGTC-166  Machining and Manufacturing II
3 units  LR
• 36 hours lecture/72 hours laboratory per term
• Prerequisite: ENGTC-165 or equivalent
This course introduces practical and theoretical aspects of advanced machine tool processes, focusing on lathe and vertical milling machine operations. Topics include precision measuring and inspection practices, surface grinding, special work holding devices, and mechanical hardware. An introduction to Geometric Dimensioning and Tolerancing (GDT) and properties of materials associated with machinability, heat treating and hardness testing is provided. CSU

ENGTC-168  Introduction to Computer Numerical Control
3 units  SC
• 36 hours lecture/72 hours laboratory per term
• Recommended: ENGIN-120 or equivalent
This course introduces students to Computer Numerical Control (CNC) machining. Students will learn the techniques of developing and programming cutting tool paths and movements using three-dimensional CAD models and working drawings. Instruction will cover the use of Computer Integrated Manufacturing package (CIM) software and visualization of cutting operations. Topics will also include setup and operation of CNC equipment for manufacturing. CSU

ENGTC-175  Hydraulic and Pneumatic Systems and Components
3 units  SC
• 18 hours lecture/108 hours laboratory per term
This course covers the practical and theoretical aspects of hydraulic and pneumatic systems. Topics include concepts, theory and common systems, components and devices. The laboratory emphasizes hands-on exercises in operation, maintenance and mechanical skills. CSU

ENGTC-176  Mechanical Systems and Components
3 units  SC
• 18 hours lecture/108 hours laboratory per term
This course covers mechanical systems with an emphasis on mechanical drives, flexible belt drives, lubrication, bearings, vibration, and rotating equipment. Topics include operation, maintenance and repair of mechanical systems and components used in a variety of industrial occupations. CSU

ENGTC-180  Applications for Industrial Robotics
3 units  SC
• 36 hours lecture/72 hours laboratory per term per term
• Prerequisite: ELTRN-107 or equivalent
• Note: Students may petition to repeat this course when software or hardware is changed. Only the first course completed will be applied toward a degree or certificate requirement. Units for both courses will apply towards the 60 units required for the degree.
This course introduces applied robotics and automation through the examination of principles of controller hardware, systems interface, and programming structure. Students will practice the skills needed to operate and control robotic devices. Students also develop autonomous systems and robotic operations within industrial applications that include research and development (R&D), advanced manufacturing, distribution logistics, and the biomedical and medical fields. CSU

ENGTC-226  Computer Aided Drafting Design, Advanced Concepts - AutoCAD
3 units  SC
• 36 hours lecture/72 hours laboratory per term
• Recommended: ENGTC-126 or ARCHI-126 or equivalent
• Note: Same as ARCHI-226. Students may petition to repeat this course when software or hardware is changed. Only the first course completed will be applied toward a degree or certificate requirement. Units for both courses will apply towards the 60 units required for the degree.
This course covers the concepts and applications of constructing digital three-dimensional (3D) models and photo-realistic renderings for presentation using AutoCAD. Advanced techniques for surface, wireframe and solid modeling will be presented. Students will explore lighting, materials mapping, and rendering as they apply to architecture, engineering and industrial design. Other software may be presented. CSU, UC (credit limits may apply to UC - see counselor)