

ENGINEERING TECHNOLOGY

Natural and Applied Sciences Division

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Engineering Technology A.S. Degree

The Engineering Technology A.S. Degree/Certificate Program has been designed under the guidance of an industry advisory board for students who have a strong interest in hands-on technical work based in electronics, manufacturing, and design drafting. Employment opportunities await our graduates locally, in the Silicon Valley, and globally. Upon entering the workforce, our graduates perform duties requiring a combination of the theoretical knowledge of an engineer and the skills of a craftsman. The following are a sampling of the many fields our graduates qualify for: engineering technician, design drafting, manufacturing, electronics, and computer animation. The Engineering Technology Department at Cabrillo College offers an A.S. Degree and a Certificate of Achievement, as well as six Skills Certificate options. Additionally, several courses carry transfer credit to baccalaureate degree granting institutions.

Note: We strongly recommend CS 1 and CS 1L for all students enrolling in computer-based Engineering Technology courses. Please refer to the Cabrillo College *Catalog* descriptions of these courses to determine if you possess equivalent knowledge.

Learning Outcomes

1. Analyze and troubleshoot electrical circuits and mechanical systems based upon industry protocols and standards. (Critical Thinking)
2. Develop a portfolio of laboratory reports that demonstrate skills acquired within a particular technology. (Communication, Professional Development)
3. Demonstrate mastery of an engineering knowledge "base equivalent" to passing an industry level certification exam from such vendors as: AutoDesk, Graphisoft, and PTC. (Global Awareness, Critical Thinking)
4. Demonstrate written and verbal communication skills through technical documentation and oral presentations. (Communication, Professional Development, Critical Thinking)

A.S. General Education	21 Units
Core Courses (27 units)	
ETECH 24	Introduction to AutoCAD3
ETECH 31	Introduction to Electronic Circuit and Schematic Design3
ETECH 41	Advanced AutoCAD.....3
ETECH 60	Architecture I.....3
ETECH 61	Architecture II3
ETECH 62	Architecture III.....3
ETECH 75	BIM and Sustainable Design Strategies I.....3
ETECH 130	Introduction to Pro/Engineer.....3
ETECH 140	3D Animation3
Approved Program Electives (5 Units) Units	
BUS 20	Introduction to Business.....3
CEM 155	Blueprint Reading.....3
CIS 72	Introduction to Operating Systems.....4
DM 2	Digital Publishing I4
DM 4	Digital Graphics3
ETECH 131	Intermediate Pro/Engineer3
ETECH 141	Intermediate Maya3
ETECH 150	ETECH Careers and Employment Preparation.....2
ETECH 199	Career Work Experience Education3
Electives:	
(Any Course numbered 1-199).....	7
Total Units	60

Engineering Technology Certificate of Achievement

Learning Outcomes

1. Develop a portfolio of laboratory reports that demonstrate skills acquired within a particular technology. (Communication, Professional Development)
2. Analyze and troubleshoot electrical circuits and mechanical systems based upon industry protocols and standards. (Critical Thinking)
3. Demonstrate mastery of an engineering knowledge “base equivalent” to passing an industry level certification exam from such vendors as: AutoDesk, Graphisoft, and PTC. (Global Awareness, Critical Thinking)

Core Courses (27 units)		Units
ETECH 24	Introduction to AutoCAD	3
ETECH 31	Introduction to Electronic Circuit and Schematic Design	3
ETECH 41	Advanced AutoCAD.....	3
ETECH 60	Architecture I	3
ETECH 61	Architecture II ..	3
ETECH 62	Architecture III	3
ETECH 75	BIM and Sustainable Design Strategies I.....	3
ETECH 130	Introduction to Pro/Engineer.....	3
ETECH 140	3D Animation	3
One of the following:		
ENGL 100	Elements of Writing.....	3
or		
ESL 100	High Advanced Academic ESL	4-6
or		
ENGL 1A/1AH/1AMC/1AMCH		3
or		
CABT 157	Business and Technical Writing	3
Total Units		30-33

Architecture Drafting and Design Skills Certificate

Learning Outcomes

1. Demonstrate mastery of an architectural knowledge “base equivalent” to obtaining an architectural ADDA certification from American Design Drafting Association. (Global Awareness, Critical Thinking)
2. Design and draft an AEC plan set. (Global Awareness, Professional Development)
3. Troubleshoot and solve design flaws on AEC plan sets. (Critical Thinking)

Required Courses		Units
ETECH 24	Introduction to AutoCAD	3
ETECH 60	Architecture I	3
ETECH 61	Architecture II.....	3
ETECH 62	Architecture III.....	3
ETECH 75	BIM and Sustainable Design Strategies I.....	3
If desired, one required Architecture Drafting and Design course may be replaced with one of the following (listed courses may require the completion of prerequisites): Units		
CEM 151	Construction Fundamentals: Principles and Practices.....	3
CEM 155	Blueprint Reading.....	3
DM 2	Digital Publishing I	4
DM 4	Digital Graphics	3
ETECH 110	Civil and Land Development CAD	3
ETECH 130	Introduction to Pro/Engineer.....	3
ETECH 131	Intermediate Pro/Engineer	3
ETECH 140	3D Animation	3
Total Units		15-16

Civil/Survey Drafting Skills Certificate

Learning Outcomes

1. Demonstrate mastery of a civil/survey knowledge “base equivalent” to obtaining an ADDA Civil certification from American Design Drafting Association. (Global Awareness, Critical Thinking)

2. Design and draft a civil/survey plan set. (Global Awareness, Professional Development)
3. Troubleshoot and solve design flaws on civil/survey plan sets. (Critical Thinking)

Required Courses		Units
ENGR 1A	*Surveying	4
ETECH 24	Introduction to AutoCAD	3
ETECH 110	Civil and Land Development CAD	3

Total Units **10**

*Requires Trigonometry as a prerequisite (Fall only)

Computer Aided Drafting and Design Skills Certificate

Learning Outcomes

1. Demonstrate mastery of a Computer Aided Drafting and Design knowledge “base equivalent” to obtaining CADD, ADDA certification from American Design Drafting Association. (Global Awareness, Critical Thinking)
2. CAD draft a complete plan set. (Global Awareness, Professional Development)
3. Troubleshoot and solve design flaws on a plan set. (Critical Thinking)

Required Courses		Units
ETECH 24	Introduction to AutoCAD	3
ETECH 41	Advanced AutoCAD	3
ETECH 75	BIM and Sustainable Design Strategies I	3
ETECH 130	Introduction to Pro/Engineer	3

If desired, one required Computer Aided Drafting and Design course may be replaced with one of the following (listed courses may require the completion of prerequisites):

	Units	
DM 2	Digital Publishing I	4
DM 4	Digital Graphics	3
ETECH 131	Intermediate Pro/Engineer	3
ETECH 140	3D Animation	3

Total Units **12-13**

Computer Animation Skills Certificate

Learning Outcomes

1. Demonstrate mastery of an animation knowledge “base equivalent” to obtaining Maya certification from Autodesk Corp. (Global Awareness, Critical Thinking)
2. Animate a short photorealistic scene. (Global Awareness, Professional Development)
3. Troubleshoot and solve design flaws on an animation. (Critical Thinking)

Required Courses		Units
ETECH 24	Introduction to AutoCAD	3
ETECH 130	Introduction to Pro/Engineer	3
ETECH 140	3D Animation	3
ETECH 141	Intermediate Maya	3

If desired, one required Computer Animation course may be replaced with one of the following (listed courses may require the completion of prerequisites):

	Units	
DM 2	Digital Publishing I	4

DM 4	Digital Graphics	3
DM 6	Digital Publishing II	3
ETECH 75	BIM and Sustainable Design Strategies I	3

Total Units **12-13**

Manufacturing Specialist Skills Certificate

Learning Outcomes

1. Demonstrate mastery of a manufacturing knowledge “base equivalent” to passing an industry level certification such as Cypress Semicon Professional Institute Certification. (Global Awareness, Critical Thinking)
2. Analyze existing electrical circuits and mechanical systems and identify weaknesses in their configurations. (Critical Thinking, Global Awareness)
3. Build simple electrical circuits and mechanical systems based upon industry protocols and standards. (Critical Thinking, Professional Development)

Required Courses		Units
PHYS 10	Introduction to Physics	3
PHYS 10L	Introduction to Physics Lab	1
COMM 6	Listening	1
CHEM 3	*Introductory Inorganic Chemistry	3
CHEM 3L	Introductory Inorganic Chemistry Laboratory	1
ETECH 24	Introduction to AutoCAD	3

Total Units **12**

*CHEM 3 has a prerequisite of MATH 152 (Intermediate Algebra)

Technology and Trades Skills Certificate

Learning Outcomes

1. Demonstrate mastery of a tradesperson’s knowledge “base equivalent” to passing an industry-level certification such as Certificate I in Engineering- Fabrication Trade. (Global Awareness, Critical Thinking)
2. Draft and build a simple wood or metal fabrication based upon industry protocols and standards. (Critical Thinking, Professional Development)
3. Analyze existing mechanical systems and identify weaknesses in their constructions. (Critical Thinking, Global Awareness)

Required Courses		Units
CEM 178A	Residential Construction Skills 1: “Front End”	3
CG 54	*Career Planning	1 - 3
CS 1L	Technology Tools	2
ENGR 5	Engineering as a Profession	2
ETECH 24	Introduction to AutoCAD	3
W 150	**Arc Welding	2

If desired, one required Technology and Trades course may be replaced with one of the following (listed courses may require the completion of prerequisites):

	Units	
ETECH 41	Advanced AutoCAD	3
ETECH 60	Architecture I	3
ETECH 61	Architecture II	3
ETECH 62	Architecture III	3
ETECH 130	Introduction to Pro/Engineer	3
ETECH 140	3D Animation	3
W 151	TIG Welding	2

Total Units **13 - 15**

*We recommend the online section to avoid scheduling difficulties with other Technology and Trades courses.

**We recommend that students complete high school algebra or MATH 154 prior to enrolling in this course.

Engineering Technology Courses

ETECH 24 Introduction to AutoCAD

3 units; 2 hours Lecture, 4 hours Laboratory

Recommended Preparation: CABT 106; Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Introduces the fundamental operating principles of AutoCAD drafting/design software. Uses AutoCAD for Windows to create and revise two-dimensional drawings. This is a foundation course that can lead to advanced study in a variety of drafting and design fields. Some of the class hours for this course may be scheduled as To Be Arranged (TBA). See the Schedule of Classes for the details about this course offering.

Transfer Credit: Transfers to CSU; UC.

ETECH 31 Introduction to Electronic Circuit and Schematic Design

3 units; 2 hours Lecture, 4 hours Laboratory

Prerequisite: ETECH 24 or equivalent skills.

Recommended Preparation: CABT 106; Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Presents the use of computer aided drafting software for the design of electronic diagrams, including schematics, wiring diagrams, block diagrams, and printed circuit fabrication drawings. Includes instruction on symbol creation, symbol library maintenance, and hands-on basic electronics. Some of the class hours for this course may be scheduled as To Be Arranged (TBA). See the *Schedule of Classes* for the details about this course offering.

Transfer Credit: Transfers to CSU.

ETECH 41 Advanced AutoCAD

3 units; 2 hours Lecture, 4 hours Laboratory

Prerequisite: ETECH 24 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Presents a second level AutoCAD and first level mechanical drafting course. Includes an introduction to the computer aided design of mechanical drawings, detailing the fabrication of mechanical parts, technical sketching, multi-view orthographics, section views, auxiliary views, 3D modeling, dimensioning, and an introduction to computer aided manufacturing. Some of the class hours for this course may be scheduled as To Be Arranged (TBA). See the *Schedule of Classes* for the details about this course offering.

Transfer Credit: Transfers to CSU.

ETECH 60 Architecture I

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Provides an overview of the field of architectural drafting and design for those interested in pursuing this occupational area of study. Includes an introduction to the professional fields of architecture, engineering, city planning, and landscape architecture. The language of architecture and the historical development of construction principles will also be emphasized.

Transfer Credit: Transfers to CSU; UC.

ETECH 61 Architecture II

3 units; 2.5 hours Lecture, 1.5 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Presents an introduction to architectural drafting/design with an emphasis on drafting construction details, and the application of construction processes/materials. AutoCAD computer aided drafting software will be introduced as a means of creating simple design projects.

Transfer Credit: Transfers to CSU.

ETECH 62 Architecture III

3 units; 2 hours Lecture, 4 hours Laboratory

Prerequisite: ETECH 24 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Covers intermediate topics in AutoCAD-based architectural drafting techniques/practices, including wood construction methods/processes, preparation of construction documents, site plans, floor plans, sections, elevations, and specifications. Some of the class hours for this course may be scheduled as To Be Arranged (TBA). See the *Schedule of Classes* for the details about this course offering.

Transfer Credit: Transfers to CSU.

ETECH 75 BIM and Sustainable Design Strategies I

3 units; 2 hours Lecture, 4 hours Laboratory

Recommended Preparation: CABT 106 or equivalent skills; Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Introduces multiple industry standard Building Information Modeling (BIM) software programs found in the architecture profession. Focuses on the basic concepts and tools needed to create a 3D virtual architectural model. Also introduces a variety of output capabilities including energy analysis software. Some of the class hours for this course may be scheduled as To Be Arranged (TBA). See the *Schedule of Classes* for the details about this course offering.

Transfer Credit: Transfers to CSU.

ETECH 110 Civil and Land Development CAD

3 units; 2 hours Lecture, 4 hours Laboratory
Prerequisite: ETECH 24 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Covers advanced design concepts for land development/facilities management projects, including interpretation of field collected data for developing topographic maps, terrain modeling, slope, aspect, profiles, and cross sections. Also includes creating and modifying object data and topologies for use in GIS, facilities management, and multi-drawing editing environments. Some of the class hours for this course may be scheduled as To Be Arranged (TBA). See the *Schedule of Classes* for the details about this course offering.

Transfer Credit: Non-transferable.

ETECH 126 3D Solid Modeling and Rendering

3 units; 2 hours Lecture, 4 hours Laboratory
Prerequisite: ETECH 24 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Covers the use of computer aided design software for 3-dimensional solid modeling and rendering of mechanical and architectural designs, including shaded and photorealistic rendering. Ability to use CAD software to draw 2D shapes, revise 2D drawings, dimension 2D drawings, and plot 2D drawings is required. Some of the class hours for this course may be scheduled as To Be Arranged (TBA). See the *Schedule of Classes* for the details about this course offering.

Transfer Credit: Non-transferable.

ETECH 130 Introduction to Pro/Engineer

3 units; 2 hours Lecture, 4 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Covers an introduction to the fundamental operating principles of Pro/Engineer software. Uses Pro/Engineer for Windows to create and revise drawings. This is a foundation course that can lead to advanced study in a variety of drafting and design fields. Some of the class hours for this course may be scheduled as To Be Arranged (TBA). See the *Schedule of Classes* for the details about this course offering.

Transfer Credit: Non-transferable.

ETECH 131 Intermediate Pro/Engineer

3 units; 2 hours Lecture, 4 hours Laboratory

Prerequisite: ETECH 130.

Recommended Preparation: Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Covers intermediate-level operating principles of Pro/Engineer software. Uses Pro/Engineer for Windows to create and revise drawings. The second of a two part Pro/E course series. Some of the class hours for this course may be scheduled as To Be Arranged (TBA). See the *Schedule of Classes* for the details about this course offering.

Transfer Credit: Non-transferable.

ETECH 138 Electromechanical Systems

3 units; 2 hours Lecture, 4 hours Laboratory
Prerequisite: ETECH 42 and ETECH 132.

Recommended Preparation: Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Covers the theory and application of mechanical devices and their control circuits. Topics include component recognition, electrical schematic diagrams, hydraulics, pneumatics, AC and DC motors, stepping motors, mechanical drive systems and servomechanisms. Provides hands-on experience with assembly/disassembly operations including maintenance and troubleshooting of small-scale electromechanical, pneumatic, and fluid power systems. Some of the class hours for this course may be scheduled as To Be Arranged (TBA). See the *Schedule of Classes* for the details about this course offering.

Transfer Credit: Non-transferable.

ETECH 140 3D Animation

3 units; 2 hours Lecture, 4 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Introduces theories and techniques of 3D computer animation. Includes an introduction to 3D model construction, animation, rigging, simulation, motion capture and rendering. Some of the class hours for this course may be scheduled as To Be Arranged (TBA). See the *Schedule of Classes* for the details about this course offering.

Transfer Credit: Non-transferable.

ETECH 141 Intermediate Maya

3 units; 2 hours Lecture, 4 hours Laboratory

Prerequisite: ETECH 140.

Recommended Preparation: Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Presents a second-level course in the use of Maya software to create animation using 3D computer models. Includes advanced 3D model construction, rendering, and animation using camera, target and object motion. Some of the class hours for this course may be scheduled as To Be Arranged (TBA). See the *Schedule of Classes* for the details about this course offering.

Transfer Credit: Non-transferable.

ETECH 150 ETECH Careers and Employment Preparation

2 units; 1 hour Lecture, 3 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Presents a review of current trends/developments in the engineering technology field with focus on skill set requirements, employment opportunities, and projected job trends associated with the various Engineering Technology branches. Mock interviews, portfolio building, and resume creation will be completed during lab sessions.

Transfer Credit: Non-transferable.

ETECH 190A-Z Special Topics in Engineering Technology

0.5 – 5 units; 0.5 hour Lecture or 1.5 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 or ESL 100 and READ 100.

Repeatability: May be taken a total of 1 time.

Selected topics in Engineering Technology not covered by regular catalog offerings. Each special topic course will be announced, described, and given its own title and letter designation in the *Schedule of Classes*. The structure and format of the classes will vary depending on the subject matter.

Transfer Credit: Non-transferable.