

ENGINEERING TECHNOLOGY

Natural and Applied Sciences Division

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Program Description:

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 craftsperson. 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 five 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.

A.S. Degree: Engineering Technology

A.S. General Education 21 Units

Core Courses (27 units)

ETECH 24	Introduction to AutoCAD	3
ETECH 31	Introduction to Electronic Circuit and Schematic Design	3
ETECH 41	Advanced AutoCAD	3
ETECH 42	Computer Aided Manufacturing I	3
ETECH 126	3D Solid Modeling and Rendering	3
ETECH 130	Introduction to Pro/Engineer	3
ETECH 132	Printed Circuit Design	3
ETECH 138	Electromechanical Systems	3
ETECH 145	ANSI Standards in Mechanical Drafting	3

Approved Program Electives (5 units)

BUS 20	Introduction to Business	3
CEM 155	Blueprint Reading	3
CIS 172	Introduction to Operating Systems	4
DM 2	Introduction to Digital Publishing Using InDesign	3
DM 4	Digital Graphics Using Photoshop and Illustrator	3
ETECH 125	3D Wireframe and Surface Modeling	3
ETECH 131	Intermediate Pro/Engineer	3
ETECH 135	Survey of Electronics Technology	3
ETECH 140	Introduction to Maya	3
ETECH 141	Intermediate Maya	3
ETECH 150	ETECH Careers and Employment Preparation	2
ETECH 199C	- Career Work Experience Education	0.5 - 4

Electives:

(Any Course numbered 1-199). 7

Total Units 60

Certificate of Achievement: Engineering Technology

Core Courses (27 units)

ETECH 24	Introduction to AutoCAD	3
ETECH 31	Introduction to Electronic Circuit and Schematic Design	3
ETECH 41	Advanced AutoCAD	3
ETECH 42	Computer Aided Manufacturing I	3
ETECH 126	3D Solid Modeling and Rendering	3
ETECH 130	Introduction to Pro/Engineer	3
ETECH 132	Printed Circuit Design	3
ETECH 138	Electromechanical Systems	3
ETECH 145	ANSI Standards in Mechanical Drafting	3

One of the following:

ENGL 100	Elements of Writing	3
or		
ENGL 1A/1AH/1AMC/1AMCH	3
or		
CABT 157	Business and Technical Writing	3

Total Units 30

Skills Certificate: Architecture Drafting and Design

Required	
ETECH 24	Introduction to AutoCAD 3
ETECH 60	Architecture I 3
ETECH 61	Architecture II 3
ETECH 62	Architecture III 3
ETECH 71	ArchiCAD I 3
<i>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):</i>	
CEM 151	Construction Fundamentals: Principles and Practices 3
CEM 155	Blueprint Reading. 3
DM 2	Introduction to Digital Publishing Using InDesign. 3
DM 4	Digital Graphics Using Photoshop and Illustrator 3
ETECH 110	Civil and Land Development CAD. 3
ETECH 126	3D Solid Modeling and Rendering 3
ETECH 130	Introduction to Pro/Engineer 3
ETECH 131	Intermediate Pro/Engineer 3
ETECH 140	Introduction to Maya 3
ETECH 175	ArchiCAD II 3
Total Units	15

Skills Certificate: Civil/Survey Drafting

Required	
ENGR 1A	*Surveying. 4
ETECH 24	Introduction to AutoCAD 3
ETECH 110	Civil and Land Development CAD. 3
Total Units	10

**Fall only; Requires Trigonometry as a prerequisite*

Skills Certificate: Computer Aided Drafting and Design

Required	
ETECH 24	Introduction to AutoCAD 3
ETECH 41	Advanced AutoCAD 3
ETECH 42	*Computer Aided Manufacturing I. 3
ETECH 125	3D Wireframe and Surface Modeling. 3
<i>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):</i>	
DM 2	Introduction to Digital Publishing Using InDesign. 3
DM 4	Digital Graphics Using Photoshop and Illustrator 3
ETECH 126	3D Solid Modeling and Rendering 3
ETECH 130	Introduction to Pro/Engineer 3
ETECH 131	Intermediate Pro/Engineer 3
ETECH 140	Introduction to Maya 3
ETECH 145	ANSI Standards in Mechanical Drafting. 3
Total Units	12

**Requires MATH 153 or high school geometry as prerequisite*

Skills Certificate: Computer Animation

Required	
ETECH 24	Introduction to AutoCAD 3
ETECH 126	3D Solid Modeling and Rendering 3
ETECH 140	Introduction to Maya 3
ETECH 141	Intermediate Maya 3
<i>If desired, one required Computer Animation course may be replaced with one of the following (listed courses may require the completion of prerequisites):</i>	
DM 2	Introduction to Digital Publishing Using InDesign. 3
DM 4	Digital Graphics Using Photoshop and Illustrator 3
DM 6	Advanced Digital Publishing Using InDesign . . 3
DM 8	Design for Digital Publishing 3
ETECH 125	3D Wireframe and Surface Modeling. 3
ETECH 130	Introduction to Pro/Engineer 3
ETECH 131	Intermediate Pro/Engineer 3
Total Units	12

Skills Certificate: Manufacturing Specialist

Required	
PHYS 10	Introduction to Physics 3
PHYS 10L	Introduction to Physics Lab. 1
ETECH 135	Survey of Electronics Technology 3
COMM 6	Listening 1
CHEM 2	*Introductory Inorganic Chemistry 4
Total Units	12

**CHEM 2 has a prerequisite of MATH 152 (Intermediate Algebra)*

Skills Certificate: Technology and Trades

Required	
CEM 178A	Residential Construction Skills 1: "Front End" . 3
CG 54	*Career Planning 2
CS 1L*	Technology Tools 2
ENGR 5	Engineering as a Profession. 2
ETECH 24	Introduction to AutoCAD 3
W 150	**Arc Welding 2
<i>If desired, one required Technology and Trades course may be replaced with one of the following (listed courses may require the completion of prerequisites):</i>	
ETECH 41	Advanced AutoCAD 3
ETECH 42	*Computer Aided Manufacturing I. 3
ETECH 60	Architecture I 3
ETECH 61	Architecture II 3
ETECH 62	Architecture III 3
ETECH 71	ArchiCAD I 3
ETECH 130	Introduction to Pro/Engineer 3
ETECH 140	Introduction to Maya 3
ETECH 175	ArchiCAD II 3
W 151	Gas and TIG Welding. 2
Total Units	14

**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 and READ 100.

Repeatability: May be taken a total of 4 times.

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.

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 and READ 100.

Repeatability: May be taken a total of 2 times.

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.

Transfer Credit: Transfers to CSU.

ETECH 41

Advanced AutoCAD

3 units; 2 hours Lecture, 4 hours Laboratory

Prerequisite: ETECH 24.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Repeatability: May be taken a total of 2 times.

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.

Transfer Credit: Transfers to CSU.

ETECH 42

Computer Aided Manufacturing I

3 units; 2 hours Lecture, 4 hours Laboratory

Recommended Preparation: ETECH 24; Eligibility for ENGL 100 and READ 100.

Repeatability: May be taken a total of 2 times.

Covers the basics of CNC G code program creation/editing in conjunction with the use of CAM software. Includes three-axis mill programming; creating part geometry, defining tools and tool paths, and using post-processors.

Transfer Credit: Transfers to CSU.

ETECH 60

Architecture I

3 units; 3 hours Lecture

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

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 and READ 100.

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.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

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.

Transfer Credit: Transfers to CSU.

ETECH 71

ArchiCAD I

3 units; 2 hours Lecture, 4 hours Laboratory

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

Repeatability: May be taken a total of 3 times.

Introduces the use of ArchiCAD architectural design software with instruction focused on the basic concepts and tools needed to create an object oriented 3D virtual model. Also included is an introduction to a variety of ArchiCAD's output capabilities. This is the first of a two-part ArchiCAD course series.

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 and READ 100.

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.

ETECH 125

3D Wireframe and Surface Modeling

3 units; 2 hours Lecture, 4 hours Laboratory

Prerequisite: ETECH 24 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Covers the use of computer aided design software for 3D wireframe and surface modeling of mechanical and architectural designs. Ability to use CAD software to draw 2D shapes, revise 2D drawings, dimension 2D drawings, and plot 2D drawings is required.

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 and READ 100.

Repeatability: May be taken a total of 2 times.

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.

ETECH 130

Introduction to Pro/Engineer

3 units; 2 hours Lecture, 4 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Repeatability: May be taken a total of 3 times.

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.

ETECH 131

Intermediate Pro/Engineer

3 units; 2 hours Lecture, 4 hours Laboratory

Prerequisite: ETECH 130.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Repeatability: May be taken a total of 3 times.

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.

ETECH 132

Printed Circuit Design

3 units; 2 hours Lecture, 4 hours Laboratory

Prerequisite: ETECH 31.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Covers the use of computer aided design software for design of electronic printed circuit boards, including footprint symbol creation, symbol library maintenance, analog/digital printed circuit design, surface mount technology, and hands-on circuit electronics instruction.

ETECH 135

Survey of Electronics Technology

3 units; 2 hours Lecture, 4 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Repeatability: May be taken a total of 2 times.

Presents a comprehensive introductory survey of electronics which includes voltage, current and resistance, types of electronic components and circuits, semiconductor devices, IC fabrication, Surface Mount Technology (SMT), and hands-on lab instruction.

ETECH 138

Electromechanical Systems

3 units; 2 hours Lecture, 4 hours Laboratory

Prerequisite: ETECH 42 and ETECH 132.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

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.

ETECH 140

Introduction to Maya

3 units; 2 hours Lecture, 4 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Repeatability: May be taken a total of 3 times.

Introduces Maya, a popular 3D animation software used in the creation of animated organic, mechanical and architectural designs. Alias/Wavefront's Maya is the current leader in the film/television industry. Includes an introduction to 3D model construction, texturing, lighting, animation, cinematography and rendering.

ETECH 141

Intermediate Maya

3 units; 2 hours Lecture, 4 hours Laboratory

Prerequisite: ETECH 140.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Repeatability: May be taken a total of 3 times.

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.

ETECH 145

ANSI Standards in Mechanical Drafting

3 units; 2 hours Lecture, 4 hours Laboratory

Prerequisite: ETECH 24 and ETECH 141 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents advanced mechanical drafting course covering the relevant American National Standards Institute standards, including geometric dimensioning/tolerancing, finish symbols, weld symbols, and other relevant symbols/conventions. Many companies require knowledge of ANSI standards for entry-level drafters. All work will be completed using AutoCAD software.

ETECH 150

ETECH Careers and Employment Preparation

2 units; 1 hour Lecture, 3 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Repeatability: May be taken a total of 2 times.

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.

ETECH 175

ArchiCAD II

3 units; 2 hours Lecture, 4 hours Laboratory

Prerequisite: ETECH 71.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Repeatability: May be taken a total of 3 times.

Teaches advanced use of ArchiCAD architectural design software with focus on it's many virtual model refinement capabilities. Includes instruction on the printing of architectural-size drawings, quantity calculations, shaded view creation, photo-realistic rendering, sun studies, animation "fly throughs," virtual reality, and panoramic scenes. This is the second of a two-part ArchiCAD course series.

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 and READ 100.

Repeatability: May be taken a total of 4 times.

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.