

Electronics Technology

Overview

The Electronics Technology Department offers a comprehensive curriculum in Telecommunications Technician, Electronics Facilities Maintenance Technician, Automated Systems Technician, Microcomputer Technician and Electronics Mechanic. The department offers career certificates and A.S. degrees in each of these disciplines. The Telecommunications, Automated Systems and Facilities Maintenance options are certified training programs for the Federal Aviation Administration Electronic Technician positions.

Career Options

The Electronics Technology/automated systems technician program consists of courses from basic electronic concepts and safety to courses in computer and smart device-controlled systems. It is designed to prepare students for employment in the automated manufacture, assembly, and testing of electronic circuit devices. This program is designed for students pursuing employment in the programming, testing, repair, and maintenance of digital and analog computer-controlled systems.

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Associate Degrees

A.S. in Automated Systems Technician

The Automated Systems Technician Program consists of courses from basic electronic concepts and safety to courses in computer and smart device controlled systems. It is designed to prepare students for employment in the automated manufacture, assembly, and testing of electronic circuit devices.

Recommended High School Preparation: Courses in electricity, electronics, English, algebra, physics, chemistry, and computers.

Program Costs: In addition to the normal student expenses (for textbooks, personal equipment, and supplies), a laboratory materials fee may be required. Students will be responsible for providing some electronic parts and purchasing a basic electronics tool kit, which is available from the Department. For specific class-required materials and texts, check with the electronics faculty or the College Store. These fees may vary each semester. If these fees create a financial burden, students should consult the Financial Aid Office for possible assistance.

Catalog Date: June 1, 2020

Degree Requirements

COURSE CODE	COURSE TITLE	UNITS
CISC 310	Introduction to Computer Information Science	3
ET 192	Introduction to Robotics	2
ET 305	DC/AC Theory and Circuit Fundamentals	4
ET 306	Electronics Fabrication and Soldering Techniques	2
ET 314	Mathematics for DC/AC Theory and Circuit Fundamentals	3
ET 322	Semiconductors and Nanotechnology	4
ET 335	Integrated Circuits with Computer Applications	4
ET 340	Basic Microprocessors	4
ET 362	Modern Electronic Control Technology	3
ET 390	Microprocessor Systems - Troubleshooting	3
ET 491	Electronics Projects Laboratory I	2
ET 492	Electronics Projects Laboratory II	2
Total Units:		36

The Automated Systems Technician Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See SCC graduation requirements.

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- demonstrate safe work practices for automated systems equipment.
- demonstrate the proper use of basic test equipment to include digital multimeters, oscilloscopes, and digital or analog signal sources.
- use a standard schematic diagram of an automated system to identify its digital or analog parts.
- explain common automated systems terminology for digital and analog devices.

- estimate automated system circuit performance using mathematical tools.
- analyze and compare calculated automated system circuit performance to actual performance.
- measure common automated system parameters using appropriate test equipment.
- set up and install basic automated system equipment.
- design proper preventive maintenance, calibration, and system testing procedures for automated equipment.
- perform proper preventive maintenance, calibration, and system testing on automated equipment.
- diagnose common automated system failures down to the source of the problem.
- solve automated system problems by replacing failed hardware or software parts.
- install, operate, and maintain modern control equipment such as Programmable Logic Controllers (PLC) and robotic controllers.

Career Information

This program is designed for students pursuing employment in the programming, testing, repair, and maintenance of digital and analog computer controlled systems.

A.S. in Telecommunications Technician

The Telecommunications Technician Program consists of courses from basic electronic concepts and safety to courses in modern communication systems and telecommunication licensing. The emphasis of this program is on modern digital high-speed communication. It is designed to prepare students for employment as technicians in the wired and wireless communication of electronic information.

Recommended High School Preparation: Courses in electricity, electronics, English, algebra, physics, chemistry, and computers.

Program Costs: In addition to the normal student expenses (for textbooks, personal equipment, and supplies), a laboratory materials fee may be required. Students will be responsible for providing some electronic parts and purchasing a basic electronics tool kit, which is available from the Department. For specific class-required materials and texts, check with the electronics faculty or the College Store. These fees may vary each semester. If these fees create a financial burden, students should consult the Financial Aid Office for possible assistance.

Catalog Date: June 1, 2020

Degree Requirements

COURSE CODE	COURSE TITLE	UNITS
ET 305	DC/AC Theory and Circuit Fundamentals	4
ET 306	Electronics Fabrication and Soldering Techniques	2
ET 314	Mathematics for DC/AC Theory and Circuit Fundamentals	3
ET 322	Semiconductors and Nanotechnology	4
ET 335	Integrated Circuits with Computer Applications	4
ET 340	Basic Microprocessors	4
ET 362	Modern Electronic Control Technology	3
ET 380	Introduction to Electronic Communications	4
ET 381	Electronic Communication Regulations	3
ET 390	Microprocessor Systems - Troubleshooting	3
ET 400	Microwave Communications Techniques	4
Total Units:		38

The Telecommunications Technician Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See SCC graduation requirements.

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- demonstrate safe work practices for telecommunication equipment.
- demonstrate the proper use of basic telecommunication test equipment to include digital multimeters, oscilloscopes, signal sources.
- use a standard schematic diagram of a telecommunication system to identify and test its parts.
- explain common telecommunication terminology.
- estimate telecommunication system circuit performance using mathematical tools.
- analyze and compare calculated telecommunication system circuit performance to actual performance.
- measure common telecommunication system circuit parameters using appropriate test equipment.
- set up and install basic telecommunication equipment.
- design proper preventive maintenance, calibration, and system testing procedures for telecommunication equipment.
- perform proper preventive maintenance, calibration, and system testing on telecommunication equipment.
- diagnose common telecommunication system failures down to the source of the problem.
- solve telecommunication system problems by replacing failed parts.
- install, operate, and maintain modern control equipment such Programmable Logic Controllers (PLC).
- examine and evaluate telecommunication systems according to FCC rules and regulations.

Career Information

This program is designed for students pursuing employment in the calibration, testing, repair, and maintenance of electronic communications equipment.

Certificates of Achievement

Automated Systems Technician Certificate

The Automated Systems Technician Program consists of courses from basic electronic concepts and safety to courses in computer and smart device controlled systems. It is designed to prepare students for employment in the automated manufacture, assembly, and testing of electronic circuit devices.

Recommended High School Preparation: Courses in electricity, electronics, English, algebra, physics, chemistry, and computers.

Program Costs: In addition to the normal student expenses (for textbooks, personal equipment, and supplies), a laboratory materials fee may be required. Students will be responsible for providing some electronic parts and purchasing a basic electronics tool kit, which is available from the Department. For specific class-required materials and texts, check with the electronics faculty or the College Store. These fees may vary each semester. If these fees create a financial burden, students should consult the Financial Aid Office for possible assistance.

Catalog Date: June 1, 2020

Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
CISC 310	Introduction to Computer Information Science	3
ET 192	Introduction to Robotics	2
ET 305	DC/AC Theory and Circuit Fundamentals	4
ET 306	Electronics Fabrication and Soldering Techniques	2
ET 314	Mathematics for DC/AC Theory and Circuit Fundamentals	3
ET 322	Semiconductors and Nanotechnology	4
ET 335	Integrated Circuits with Computer Applications	4
ET 340	Basic Microprocessors	4
ET 362	Modern Electronic Control Technology	3
ET 390	Microprocessor Systems - Troubleshooting	3
ET 491	Electronics Projects Laboratory I	2
ET 492	Electronics Projects Laboratory II	2
Total Units:		36

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- demonstrate safe work practices for automated systems equipment.
- demonstrate the proper use of basic test equipment to include digital multimeters, oscilloscopes, and digital or analog signal sources.
- use a standard schematic diagram of an automated system to identify its digital or analog parts.
- explain common automated systems terminology for digital and analog devices.
- estimate automated system circuit performance using mathematical tools and simulation software.
- analyze and compare calculated automated system circuit performance to actual performance.
- measure common automated system parameters using appropriate test equipment.
- set up and install basic automated system equipment.
- design proper preventive maintenance, calibration, and system testing procedures for automated equipment.
- perform proper preventive maintenance, calibration, and system testing on automated equipment.
- diagnose common automated system failures down to the source of the problem.
- solve automated system problems by replacing failed hardware or software parts.
- install, operate, and maintain modern control equipment such as Programmable Logic Controllers (PLC) and robotic controllers.

Career Information

This program is designed for students pursuing employment in the programming, testing, repair, and maintenance of digital and analog computer controlled systems.

Telecommunications Technician Certificate

The Telecommunications Technician Program consists of courses from basic electronic concepts and safety to courses in modern communication systems and telecommunication licensing. The emphasis of this program is on modern digital high-speed communication. It is designed to prepare students for employment as technicians in the wired and wireless communication of electronic information.

Recommended High School Preparation: Courses in electricity, electronics, English, algebra, physics, chemistry, and computers.

Program Costs: In addition to the normal student expenses (for textbooks, personal equipment, and supplies), a laboratory materials fee may be required. Students will be responsible for providing some electronic parts and purchasing a basic electronics tool kit, which is available from the Department. For specific class-required materials and texts, check with the electronics faculty or the College Store. These fees may vary each semester. If these fees create a financial burden, students should consult the Financial Aid Office for possible assistance.

Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
ET 305	DC/AC Theory and Circuit Fundamentals	4
ET 306	Electronics Fabrication and Soldering Techniques	2
ET 314	Mathematics for DC/AC Theory and Circuit Fundamentals	3
ET 322	Semiconductors and Nanotechnology	4
ET 335	Integrated Circuits with Computer Applications	4
ET 340	Basic Microprocessors	4
ET 362	Modern Electronic Control Technology	3
ET 380	Introduction to Electronic Communications	4
ET 381	Electronic Communication Regulations	3
ET 390	Microprocessor Systems - Troubleshooting	3
ET 400	Microwave Communications Techniques	4
Total Units:		38

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- demonstrate safe work practices for telecommunication equipment.
- demonstrate the proper use of basic telecommunication test equipment to include digital multimeters, oscilloscopes, signal sources.
- use a standard schematic diagram of a telecommunication system to identify and test its parts.
- explain common telecommunication terminology.
- estimate telecommunication system circuit performance using mathematical tools.
- analyze and compare calculated telecommunication system circuit performance to actual performance.
- measure common telecommunication system circuit parameters using appropriate test equipment.
- set up and install basic telecommunication equipment.
- design proper preventive maintenance, calibration, and system testing procedures for telecommunication equipment.
- perform proper preventive maintenance, calibration, and system testing on telecommunication equipment.
- diagnose common telecommunication system failures down to the source of the problem.
- solve telecommunication system problems by replacing failed parts.
- install, operate, and maintain modern control equipment such Programmable Logic Controllers (PLC).
- examine and evaluate telecommunication systems according to FCC rules and regulations.

Career Information

This program is designed for students pursuing employment in the calibration, testing, repair, and maintenance of electronic communications equipment.

Electronics Technology (ET) Courses

ET 140 Smart Computing Device System Repair I

Units:	4
Hours:	48 hours LEC; 72 hours LAB
Prerequisite:	None.
Catalog Date:	June 1, 2020

This is an introductory course to smart computing system repair. The course will begin with an overview of the history of computing systems and repair. Information of common computer system repair, nomenclature, diagnostic software, and the theory of computing systems operations will be covered. The course will also introduce the student to the use of the Internet for locating technical repair documentation on the Web.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- understand the history of smart computing devices.
- analyze the problem symptoms of a failed smart device.
- install and maintain smart device systems.
- identify and use diagnostic software.
- collect computer repair information through the use of the internet.
- demonstrate current, basic repair techniques used in smart computing systems.

ET 141 Smart Computing Device System Repair II

Units:	3
Hours:	36 hours LEC; 54 hours LAB
Prerequisite:	ET 140 with a grade of "C" or better
Catalog Date:	June 1, 2020

This is a second course in a series of two designed to train students in the advanced skills needed in the installation, maintenance, and repair of modern computer smart devices and systems.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- analyze and classify smart computing device system needs and repair concepts.
- design the steps in the organization, installation, and repair of smart computing devices and systems.
- research and learn troubleshooting philosophies and techniques including system protocols.
- implement problem-solving techniques in a typical industrial, business, or personal setting for smart devices.

ET 192 Introduction to Robotics

Units:	2
Hours:	18 hours LEC; 54 hours LAB
Prerequisite:	None.
Catalog Date:	June 1, 2020

This course is an introduction to robotics utilizing various robotic systems. It explores how robots and microcontrollers interface with common electronic applications. It also investigates various applications for robots and microcontrollers. One or two field trips to local manufacturing facility such as Siemens Transportation may be required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply the rules of electrical safety when working with stamp microcontrollers.
- identify and describe the terminology used when working with stamp microcontrollers.
- assemble a typical robot kit.
- create programs for the stamp microcontroller.
- identify and name the internal components that make up the stamp microcontroller.
- download updated microcontroller software from manufacturers.
- create programs for various robotic tasks.
- create infrared and other navigation systems for robot navigation.
- diagnose robot hardware and software problems.

ET 210 Applied Mathematics for Electronics

Units:	3
Hours:	54 hours LEC
Prerequisite:	None.
Catalog Date:	June 1, 2020

This is a basic course for those interested in cabling and installation electronics who do not meet the requirements for ET 314. Units of instruction include DC and AC circuit application mathematics, scientific calculators, powers of ten, and introduction to algebraic concepts as related to electronics.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate an understanding of mathematics directly concerned with application to DC/AC circuits and electronic cabling.
- demonstrate an understanding of electrical concepts related to components in DC/AC circuits.
- demonstrate an understanding of the use of a calculator to calculate solutions to electronic circuit and cabling problems.

ET 220 A Survey of AC and DC Circuit Fundamentals

Units:	5
Hours:	54 hours LEC; 108 hours LAB
Prerequisite:	ET 210 and 230 with grades of "C" or better or equivalent.
Catalog Date:	June 1, 2020

This course is designed to provide instruction in the basic concepts of AC and DC theory including a study of resistors, capacitors, and inductors in series and parallel circuits. Laboratory use of meters, oscilloscopes, signal generators, and power supplies will be emphasized.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate the basic concepts of DC and AC circuit theory.
- demonstrate the application and use of RLC series and parallel circuits.
- demonstrate the proper use and maintenance of laboratory meters, oscilloscopes, signal generators, and power supplies.

ET 230 Laboratory Practices and Techniques

Units:	1
Hours:	54 hours LAB
Prerequisite:	None.
Advisory:	Concurrent enrollment in ET 210.
Catalog Date:	June 1, 2020

This course provides instruction in the language of electronics, safe and efficient use of tools, equipment, and chemical processes used in the laboratory including: high voltage precautions, printed circuit fabrication, equipment panel fabrication silkscreen, and state-of-the-art soldering techniques.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate the language of electronics.
- demonstrate safe implementation of high voltage precautions and safe efficient use of tools and equipment.
- demonstrate the proper use of chemical processes used in the laboratory including printed circuit fabrication and equipment panel fabrication silkscreen.
- demonstrate state-of-the-art soldering techniques.

ET 240 A Survey of Semiconductor Theory

Units:	5
Hours:	54 hours LEC; 108 hours LAB
Prerequisite:	ET 220 with a grade of "C" or better or equivalent.
Catalog Date:	June 1, 2020

This course provides a survey of diodes, transistors, FET's, and linear and digital IC's and how they are installed and used in modern electronic equipment. Laboratory will stress the hands-on manufacturing and troubleshooting of modern electronic equipment.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate a working knowledge of: diodes, power supplies, filters, transistors, transistor amplifiers, FET's, FET amplifiers, IC's, IC circuits.
- troubleshoot each type of circuit.

ET 295 Independent Studies in Electronics Technology

Units:	1 - 3
Hours:	54 - 162 hours LAB
Prerequisite:	None.
Catalog Date:	June 1, 2020

Independent study of an electronic topic or research project. This course is for students who wish to develop an in-depth understanding in fundamental topics of electronics technology and learn to work in a collaborative atmosphere with instructors and other students. Instructor approval is required to enroll in this course.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate the ability to select a suitable topic for investigation and to appreciate its relationship with current developments in the respective subject areas.
- demonstrate the ability to define clear research objectives and to select and review secondary sources that are relevant to the research questions in a structured and organized manner.
- design appropriate primary research projects that address the defined research objectives.
- deduce meaningful conclusions and recommendations from the sources reviewed and research conducted.
- work collaboratively with an instructor or instructors and other students.

ET 299 Experimental Offering in Electronics Technology

Units:	0.5 - 4
Prerequisite:	None.

Catalog Date: June 1, 2020

ET 305 DC/AC Theory and Circuit Fundamentals

Units: 4
Hours: 54 hours LEC; 54 hours LAB
Prerequisite: None.
Corequisite: ET 306 and 314
Transferable: CSU
Catalog Date: June 1, 2020

This course is designed to provide instruction in the concepts of DC and AC theory including a study of the composition of matter, circuit fundamentals, voltage, current, resistance in series, parallel, and combination circuit configurations. Laboratory activities provide hands-on projects that include operation and use of electronic equipment used by industry.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate an understanding of the basic concepts of DC and AC circuit theory.
- demonstrate an understanding of electronic components in series and parallel circuits.
- diagnose the proper operation of circuits in the laboratory using meters and power supplies.
- incorporate specialized instruments in a laboratory or workbench environment to demonstrate an understanding of DC and AC circuit parameters.

ET 306 Electronics Fabrication and Soldering Techniques

Units: 2
Hours: 18 hours LEC; 54 hours LAB
Prerequisite: None.
Advisory: Successful completion of or concurrent enrollment in ET 305.
Transferable: CSU
Catalog Date: June 1, 2020

This course covers the skills needed for identification and the safe and efficient use of hand tools and soldering equipment used in basic electronics repair. Familiarization with fabrication, soldering/de-soldering techniques, electrostatic discharge (ESD), assembly, and safety practices are covered.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply all aspects of shop safety.
- identify and describe tools and equipment necessary for electronics repair and assembly.
- formulate techniques and skills required for soldering and desoldering electronics components.
- assemble various cable and test leads.
- recognize the potential associated with electrostatic discharge (ESD).
- apply the skills of soldering in the repair and reworking of printed circuit boards and component assembly.

ET 314 Mathematics for DC/AC Theory and Circuit Fundamentals

Units: 3
Hours: 54 hours LEC
Prerequisite: One year of high school algebra with a grade of "C" or better, or qualifying mathematics assessment test scores or equivalent.
Corequisite: ET 305
Transferable: CSU
General Education: AA/AS Area II(b)
Catalog Date: June 1, 2020

This course focuses on the application of and analysis by algebra and trigonometry to solve electronic problems in DC and AC circuits. This course was formerly known as ET 310 and ET 311.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- formulate an understanding in the application of basic concepts of algebra and use it to solve electronic problems in DC series/parallel circuits.
- calculate problem solutions in DC circuits using computer applications, calculators, and other computing devices related to circuit solutions.
- formulate an understanding in the application of basic concepts of algebra and trigonometry to solve electronic problems in AC series/parallel circuits.
- calculate problem solutions in AC circuits using computer applications, calculators, and other computing devices related to circuit solutions.
- apply the use of powers of ten, logarithms, and other specialized concepts of algebra and trigonometry.

ET 315 Mathematics for Semiconductor Theory

Units:	3
Hours:	54 hours LEC
Prerequisite:	ET 305, 306, and 314 with grades of "C" or better; or equivalent.
Advisory:	Concurrent enrollment in ET 322 and 335.
Transferable:	CSU
Catalog Date:	June 1, 2020

This course provides a detailed study of the mathematics required to solve problems in semiconductor circuit theory. Some of these math functions include: vector algebra, load line plotting, decibel theory and application, common and natural log functions, power supply analysis, calculation of input and output bandwidth characteristics of semiconductor amplifiers, use of rate-of-change functions to study slope of lines and their relationship to amplifier impedances, and use of network theorems to simplify complex biasing networks for amplifiers.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- use mathematical concepts necessary to plot load lines of typical amplifiers.
- solve typical bias problems for amplifiers using Nortons and Thevenins theorems.
- solve bandwidth problems of typical amplifiers using logs and decimal numbers.
- demonstrate the proper use of rate-of-change concepts to solve for amplifier parameters.
- solve power supply problems.

ET 322 Semiconductors and Nanotechnology

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	ET 305 with a grade of "C" or better
Corequisite:	ET 314; completion of or concurrent enrollment in ET 314
Transferable:	CSU
Catalog Date:	June 1, 2020

This course is a detailed study of semiconductor devices and their applications. Semiconductor components - such as diodes, transistors, op-amps, including their use in complex circuits - are covered. Nanotechnology theory and devices, including their present and possible future applications, are studied. One or two field trips may be required. This course was formerly known as ET 320.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- compare the physical construction and theory of operation of junction diodes, bipolar junction transistors, field effect transistors, and operational amplifiers.
- troubleshoot linear and switch-mode power supplies.
- diagnose amplifier, power supply, and driver circuit problems.
- calculate theoretical operating characteristics and compare to measured results on operating amplifier circuits.
- diagram and label the functional blocks of amplifiers and power supplies.
- interpret schematic diagrams and formulate solutions to problems in electronic circuitry.
- assess data from a variety of test and measurement equipment used in the analysis of power supply and amplifier circuits.
- describe basic nanotechnology building blocks and their possible uses.
- design and simulate circuits in software.
- construct and test circuits on prototyping boards and printed circuit boards.

ET 335 Integrated Circuits with Computer Applications

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	ET 305 with a grade of "C" or better
Transferable:	CSU
Catalog Date:	June 1, 2020

This course covers integrated circuits (ICs) and applications used in industrial and consumer products. Topics include digital theory and applications from standard transistor-transistor logic (TTL) logic circuits to complex circuits built on programmable logic devices (PLDs). One or two field trips may be required. This course was formerly known as ET 330.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- operate an oscilloscope and various measurement equipment to measure and interpret electrical signals.
- analyze schematic diagrams.
- evaluate a signal through a circuit using a schematic diagram and an oscilloscope.
- investigate basic semiconducting devices
- compare the schematic symbol, truth-table, and theory of operation of the seven basic logic gates.
- generate decoder circuits from logic gates and evaluate the output of decoder circuits.
- convert logic circuits to Boolean equations.
- convert Boolean equations to logic circuits.
- analyze and simplify Karnaugh maps from Boolean equations.

- compare the schematic symbol, truth-table, and theory of operation of the three basic latches.
- design and evaluate decoder display circuits.
- analyze the operation of "divide by n" counter circuits.
- design timer circuits using the 555 timer, capacitive reactance, and RC circuits.
- construct and evaluate analog to digital converters.
- compare the operational characteristics of digital devices.

ET 340 Basic Microprocessors

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	None.
Transferable:	CSU
Catalog Date:	June 1, 2020

This is a beginning course dealing with the circuitry and use of the microprocessor. Peripheral hardware is also considered so that the student may gain an overview of a complete computer system. The scope of the course includes machine language programming in order to provide a base for understanding the dynamic operation of the entire system. Troubleshooting philosophy is emphasized.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- develop basic central processing unit programs to access input-output devices and peripheral hardware.
- organize, install, and repair a microcomputer.
- implement microprocessor technology in a typical industrial setting.

ET 350 Receiver Circuits

Units:	5
Hours:	54 hours LEC; 108 hours LAB
Prerequisite:	ET 315, 322, and 335 with grades of "C" or better or equivalent.
Transferable:	CSU
Catalog Date:	June 1, 2020

This course focuses on the principles of radio receivers using AM, FM, and single sideband modulation systems. The course presents associated control circuits and power supply circuitry for receivers.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply and operate basic radio equipment in the electronics industry.
- assemble an AM/FM radio receiver.
- demonstrate the principles of modern radio receivers.
- demonstrate and practice troubleshooting in the modern radio receiver.
- diagnose and resolve modern radio receiver problems.

ET 360 Electronic Servicing and Calibration Techniques

Units:	3
Hours:	36 hours LEC; 54 hours LAB
Prerequisite:	ET 315, 322, and 335 with grades of "C" or better or equivalent.
Transferable:	CSU
Catalog Date:	June 1, 2020

This course focuses on developing familiarization with laboratory and test instruments and techniques of calibration and repair. It is a practical step-by-step approach for the beginning technician in the art of troubleshooting techniques on all the electronic equipment available in the electronics laboratory.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate a functional knowledge of the operation of different types of test equipment.
- perform proper calibration techniques for electronic test equipment.
- demonstrate the operational tests of electronic workbench test equipment.
- diagnose and troubleshoot typical test equipment.

ET 362 Modern Electronic Control Technology

Units:	3
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Hours:	36 hours LEC; 54 hours LAB
Prerequisite:	None.
Corequisite:	ET 305; or prior completion of with a grade of "C" or better.
Transferable:	CSU
Catalog Date:	June 1, 2020

This course introduces the principles and applications of automatic control systems. Topics include general feedback control systems, analog control systems, digital control systems, Programmable logic controller (PLC) systems, sensors, and actuators. One or two field trips may be required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- understand the basic principles of automatic control systems.
- design, build, and test analog control circuits using op amps and other electronic devices.
- understand the basic principles of microprocessor-based control systems.
- develop software programs for Programmable Logic Controllers (PLC).
- design and build interface circuits between controllers and sensors.
- design and build interface circuits between controllers and actuators.
- design, build, program, and test a small-scale complete control system using Programmable Logic Controllers (PLC).
- understand the principle of feedback control.

ET 380 Introduction to Electronic Communications

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	ET 314 and 322 with grades of "C" or better
Transferable:	CSU
Catalog Date:	June 1, 2020

This course covers electronic communications including UHF, VHF, microwave, satellite, and fiber optics. AM and FM transmitters, transmission lines, antennas, and receivers are analyzed down to the component level. Propagation, wave theory, decibels, and signal transmission limitations are also covered. Technician safety and proper test equipment use are stressed throughout the course. Field trips may be required.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- operate a variety of major electronic circuits used in communication equipment.
- analyze and troubleshoot various problems in electronic communication circuits.
- perform repairs and adjustments to electronic communication systems to operate at factory specifications.
- design and build several common circuits used in electronic communication systems.
- diagnose problems in electronic communication systems.

ET 381 Electronic Communication Regulations

Units:	3
Hours:	54 hours LEC
Prerequisite:	ET 322 with a grade of "C" or better
Advisory:	ET 380 with a grade of "C" or better
Transferable:	CSU
Catalog Date:	June 1, 2020

This course provides an overview of the Federal Communication Commission (FCC) General Radiotelephone license requirements. It also covers the electronics theory and the rules and regulations mandated by the FCC.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- describe the requirements for the FCC General Class Radiotelephone license.
- differentiate maritime and international law and operating procedures.
- apply alternating current (AC) and direct current theory.
- analyze and design basic diode and transistor circuits.
- analyze operational amplifier and digital theory.
- apply receiver and transmitter theory to set up and troubleshoot telecommunication units and systems.
- apply antenna theory.
- investigate aircraft navigation equipment theory and practices.
- apply marine navigation equipment theory.

ET 390 Microprocessor Systems - Troubleshooting

Units:	3
Hours:	18 hours LEC; 108 hours LAB
Prerequisite:	ET 340 with a grade of "C" or better or equivalent.
Transferable:	CSU
Catalog Date:	June 1, 2020

This course will focus on the principles of microprocessor system control and troubleshooting. Study will include measurement transducers, analog-to-digital and digital-to-analog converters, power supplies, and power users. The design, construction, repair, and operation of a semester lab project controlled by a microprocessor, microcontroller, or a smart digital device will be covered.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate electrical techniques for the troubleshooting of various physical phenomena measuring devices.
- devise and couple measurement devices into a microprocessor.
- interpret microprocessor output that controls power users such as a motor or heater.
- measure and interpret physical phenomena using a smart device and program designed to autonomously control the phenomena.

ET 400 Microwave Communications Techniques

Units:	4
Hours:	54 hours LEC; 54 hours LAB
Prerequisite:	ET 315, 322, and 335 with grades of "C" or better or equivalent.
Transferable:	CSU
Catalog Date:	June 1, 2020

This course is a study of electromagnetic waves and antennas. The course presents types of microwave generators, microwave communications systems, and antenna guidance systems. The use of lasers and fiber optics in communications systems and as a source of high tech energy control are presented.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate an understanding of antenna theory and digital and analog communication systems at microwave frequencies.
- demonstrate measurement techniques used in finding standing wave ratios, reflection coefficients, and power losses.
- assemble and demonstrate a functional fiber optics communications link.
- diagnose changes to a fiber optics communications link with changes in power, fiber, and length used in digital and analog communications link system.
- demonstrate an understanding and proper use of lasers in digital and analog communication systems.

ET 410 Transmitter Fundamentals

Units:	5
Hours:	54 hours LEC; 108 hours LAB
Prerequisite:	ET 315, 322, and 335 with grades of "C" or better or equivalent.
Transferable:	CSU
Catalog Date:	June 1, 2020

This is a fundamental course in AM/FM and single side-band transmitters. The course will present students with preparation for employment in the communications industry. It will include instruction in adjustment and tuning of transmitters. Students are presented with symptoms of malfunctions and remedies in troubleshooting transmitters.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate a familiarization with modulation methods employed in AM, FM, and pulse transmitters.
- distinguish among the different sections of transmitters.
- measure characteristic parameters of each subsection of a transmitter and assemble a diagnostic characteristic chart.
- synthesize the steps needed to test a transmitter circuit.
- compile a list of standard, generic troubleshooting techniques used in transmitters.
- assemble a functional radio frequency antenna.
- measure antenna characteristics and assemble a final antenna report.

ET 491 Electronics Projects Laboratory I

Units:	2
Hours:	108 hours LAB
Prerequisite:	None.
Corequisite:	ET 306; Students may have completed ET 306 previously.

Transferable: CSU
Catalog Date: June 1, 2020

This course provides an opportunity for students to pursue typical electronics projects to learn and practice skills needed in the construction, installation, maintenance, and repair of electronic devices.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- analyze trouble areas in typical electronic equipment.
- operate, maintain, and repair electronic equipment based on specifications and tolerances.
- practice basic skills for fabricating and repairing electronic circuits.
- build and pursue an independent project from development to a successful completion.

ET 492 Electronics Projects Laboratory II

Units: 2
Hours: 108 hours LAB
Prerequisite: None.
Corequisite: ET 306; Students may have completed ET 306 previously.
Transferable: CSU
Catalog Date: June 1, 2020

This course provides an opportunity for students to develop and practice skills necessary for the construction, installation, maintenance, and repair of electronic devices. Students will develop, design, and construct a project under the guidance of the instructor.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- analyze trouble areas in typical electronic equipment.
- operate, maintain, and repair electronic equipment based on specifications and tolerances.
- practice basic skills for fabricating and repairing electronic circuits.
- build and pursue an independent project from development, design, and construction to a successful completion.
- construct, install, maintain, and repair electronic equipment to a level used by the electronic industry.

ET 494 Topics in Electronics Technology

Units: 0.5 - 4
Prerequisite: None.
Transferable: CSU
Catalog Date: June 1, 2020

This is a specialized course developed in cooperation with industry to address emerging training needs. Units are awarded on the basis of .5 unit for each 9 hours of lecture or 27 hours of lab.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate analytical and critical thinking skills as they relate to the study of electronics.
- demonstrate an understanding of and apply principles of electronics.
- collect (through research) and interpret data related to the topic area content.

ET 495 Independent Studies in Electronics Technology

Units: 1 - 3
Hours: 54 - 162 hours LAB
Prerequisite: None.
Transferable: CSU
Catalog Date: June 1, 2020

Independent study of an electronic topic or research project. This course is for students who wish to develop an in-depth understanding in fundamental topics of electronics technology and learn to work in a collaborative atmosphere with instructors and other students. Instructor approval is required to enroll in this course.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate the ability to select a suitable topic for investigation and to appreciate its relationship with current developments in the respective subject areas.
- demonstrate the ability to define clear research objectives and select and review secondary sources that are relevant to the research questions in a structured and organized manner.
- design appropriate primary research projects that address the defined research objectives.
- deduce meaningful conclusions and recommendations from the sources reviewed and research conducted.

- work collaboratively with an instructor or instructors and other students.

ET 498 Work Experience in Electronics Technology

Units:	1 - 4
Hours:	18 hours LEC; 60 - 300 hours LAB
Prerequisite:	None.
Enrollment Limitation:	According to Education Code Title V regulations, a student cannot earn academic credits in a Work Experience class unless s/he has either a job or an internship.
Transferable:	CSU
Catalog Date:	June 1, 2020

This course provides students with opportunities to develop or add marketable skills related to their vocational study programs. Course content will include understanding the application of the student's education to the workforce; the responsibilities of an internship (where applicable); completion of Title V Education Code papers (the student's Application, Learning Objectives, Time sheet, and Evaluations), which document the student's progress and hours spent at the work or internship site; and developing workplace (soft) skills identified by the Secretary's Commission on Achieving Necessary Skills (SCANS) Competencies, as well as by local employers. In addition, the student is required to fulfill 18 hours lecture and 75 hours of related, paid work experience or 60 hours of volunteer work experience for one unit; 75 or 60 hours of related work experience for each additional unit. The program allows the transfer student to combine practical, paid or non-paid work experience with college training. Only one Work Experience course may be taken per semester.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply classroom study through application of planned, supervised, on-the-job experience.
- develop practical workplace (soft) skills, acquire knowledge, and build confidence in the workplace.
- evaluate himself/herself in the following Career/Life Planning Process: Self-Awareness; Career Awareness; Decision Making & Goal Setting; Job Search & Workplace Success; Balanced Lifestyle.
- improve the student's potential for promotion in the workplace.
- develop skills to conduct him/herself in a professional manner in the workplace.

ET 499 Experimental Offering in Electronics Technology

Units:	0.5 - 4
Prerequisite:	None.
Transferable:	CSU
Catalog Date:	June 1, 2020

Faculty

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Adjunct Assistant Professor

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Business and Industry

[\(/academics/meta-majors/business-and-industry\)](#)

This program is part of the Business and Industry meta major.

BUSINESS AND INDUSTRY > (/ACADEMICS/META-MAJORS/BUSINESS-AND-INDUSTRY)