ELECTRICITY, ELECTRONICS, AND TECHNICAL CALCULATIONS

The Electricity/Electronics curriculum is designed to provide entry-level job training in this broad and expanding field. These classes lead to trainee positions in maintenance, installation, field service, networking, and apprenticeship in the area of specialization. Students who seek a Certificate or an Associate of Science Degree in the fields below will complete a series of Electronics Technology courses common to electricity, communications, and computers and then complete the appropriate area of specialization:

a. Electronics Technology,
b. Communication Engineering Technology,
c. Computer Engineering Technology,
d. Electric Power Technology, or
e. Avionics Technology,

A certificate is also available in the General Electrician Certification Program.

Students planning to transfer to a four-year institution and major in electronics should consult with a counselor regarding the transfer process and lower division requirements.

Contact Information

Division: Applied Technology, Transportation, and Culinary Arts (T - 108)

Division Phone Number: (909) 384-4451

Faculty Chair: Tarif (Terry) Halabi (thalabi@sbccd.edu), M.S.E.E.

Counselor Liaisons: Debbie Orozco (dorozco@sbccd.edu), M.A. and Patricia Jones (pjones@sbccd.edu), M.A.

Students working for a degree or certificate in Electricity/ Electronics must have a basic knowledge of arithmetic, reading and writing in order to learn and work in the occupations they select. The programs offered will prepare student with the fundamentals of electronics technology by offering courses common to electricity, communications and computers, and power technology. This preparation can be for transfer to the university or for further study in areas of communications, computers, electricity, and aircraft electronics. It can also prepare students for entry-level positions in electronics maintenance, installation, field service, networking, and apprenticeship in the field of electronics technology. Students should have normal color vision, and hand/eye coordination.

- Avionics Technology Associate of Science Degree
- Avionics Technology Certificate of Achievement
- Communication Engineering Technology Associate of Science Degree
- Communication Engineering Technology Certificate of Achievement
- Computer Engineering Technology Associate of Science Degree
- Computer Engineering Technology Certificate of Achievement
- Electric Power Technology Associate of Science Degree
- Electric Power Technology Certificate of Achievement
- Electronics Technology Associate of Science Degree
- Electronics Technology Certificate of Achievement
- General Electrician Certificate of Achievement
- Green Technician Certificate of Career Preparation
- Industrial Automation Certificate of Achievement
- Smart Systems Automation Technology Certificate of Completion
- Zero Net Energy Certificate of Achievement

ELEC 021 3 Units
Blueprint Reading for Building Energy Systems
Lecture: 54 contact hours
Advisory: TECALC 087
This course is a study of basic information for reading blueprints and construction drawings. It is designed for those who must assimilate information found in working drawings and specifications.
Associate Degree Applicable

ELEC 050 4 Units
Zero Net Energy Building Science
Lecture: 72 contact hours
Zero Net Energy (ZNE) Building Science includes an overview of many progressive measures that improve the energy performance of buildings. Studies focus on architectural design of building, construction methodology, green HVAC systems, renewable energy systems and the terminology used in the ZNE Industry. A survey of projects, policies and programs driving ZNE performance in residential and non-residential buildings will be studied.
Associate Degree Applicable

ELEC 091 3 Units
Fundamentals of Solar Energy
Lecture: 54 contact hours
This course is designed for students interested in a career in the solar industry. The fundamental principles and functions of the photovoltaic industry will be introduced along with the planning, installation and maintenance of all necessary components for a photovoltaic system. The transmission and distribution of electric power will be reviewed, and basic concepts of electricity, identification, functions and operations of components will be surveyed. At the end of this course, students will be prepared to complete industry certification examinations.
Associate Degree Applicable

ELEC 101 3 Units
Supply Chain Technology
Lecture: 36 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 110 and ELECTR 111
This course is an industrial technology overview covering the basic knowledge and skills needed for supply chain technicians to successfully work in automated factories, warehouses, and distribution centers. Introduction to the troubleshooting and maintenance of complex electromechanical systems is a major focus of this class.
Associate Degree Applicable
Transfers to CSU only

ELEC 215C 4 Units
Electrical Control of Hydraulic-Pheumatic Systems
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 115 and ELECTR 116
This course introduces hydraulic/pneumatic fundamentals, principle of electrical control of hydraulic/pneumatic systems, electrical concepts of ladder diagrams, functional systems of electrical/hydraulic/pneumatic sequencing of actuators, industrial applications, industrial-type hydroelectric and electro pneumatic circuits, and troubleshooting electrically controlled hydraulic/pneumatic systems.
Associate Degree Applicable
Transfers to CSU only

ELEC 216C 4 Units
Introduction to Industrial Electricity
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 110 and ELECTR 111
This course covers the study of electrical power transmission, the National Electrical Code, electrical blueprints, residential and commercial wiring.
Associate Degree Applicable
Transfers to CSU only

ELEC 217C 4 Units
Industrial Electricity
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 115 and ELECTR 116
This course covers the study of DC motors, single and polyphase AC motors, and the necessary controls and measuring equipment used for industrial circuit protection and switching equipment.
Associate Degree Applicable
Transfers to CSU only

ELEC 218C 4 Units
Controlling Industrial Electricity
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 115 and ELECTR 116
This course covers the study of DC, AC, and polyphase motor operation, mechanical and programmable machine controls, relays and programmable logic controllers (PLCs), ladder logic diagrams and the communication network linking the programmer, the controller, the laptop computer and the machine.
Associate Degree Applicable
Transfers to CSU only

ELEC 219C 4 Units
Industrial Electronic Systems Controls II
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: ELEC 218C
This course examines system application of industrial electronic systems (PLC) including industrial production and processes, automation, and programmable motor controllers. Emphasis is on programmable logic controllers.
Associate Degree Applicable
Transfers to CSU only

ELEC 606 Noncredit
Programmable Logic Controller (PLC)
Lecture: 54 contact hours
The purpose of this noncredit electronics technology course is to align with the growing portion of the electronic companies that can employ workers with specific skills/knowledge and specialize in the field of control systems.

ELEC 607 Noncredit
Preparation for Journeyman Electrician Exam
Lecture: 54 contact hours
The purpose of this noncredit electrical technology course is to allow a growing population of electrical workers understand specific sections of the National Electrical Code (NEC). The course includes the expected knowledge of the service, load calculations, grounding and overcurrent protection for conductors, motors, and transformers.

ELEC 608 Noncredit
Wireless Communications
Lecture: 54 contact hours
The purpose of this noncredit electronics technology course is to align with the growing portion of the electronic companies that can employ workers with specific skills, knowledge and specialize in the field of wireless communications.

ELEC 609 Noncredit
Antennas and Wave Propagation
Lecture: 27 contact hours
The purpose of this noncredit electronics technology course is to align with the growing portion of the electronic companies that can employ workers with specific skills, knowledge and specialize in the field of antennas and wave propagation.

ELEC 621 Noncredit
Blueprint Reading for Building Energy Systems
Lecture: 54 contact hours
This noncredit course is a study of basic information for reading blueprints and construction drawings. It is designed for those who must assimilate information found in working drawings and specifications.

ELEC 650 Noncredit
Zero Net Energy Building Science
Lecture: 72 contact hours
Zero Net Energy (ZNE) Building Science noncredit course includes an overview of many progressive measures that improve the energy performance of buildings. Studies focus on architectural design of building, construction methodology, green HVAC systems, renewable energy systems and the terminology used in the ZNE Industry. A survey of projects, policies and programs driving ZNE performance in residential and non-residential buildings will be studied.

ELECTR 098 1-4 Units
Electronics Work Experience
WRKEX: 300 contact hours
Supervised training, in the form of on the job employment that will enhance the student's knowledge in the selected field of study. The student's major and job must match. For paid work, 75 hours = 1 unit; for volunteer work, 60 hours = 1 unit. Students may earn a total of 16 units toward graduation in Work Experience 098 courses. See department for specific guidelines.
Associate Degree Applicable

ELECTR 110 3 Units
Direct Current Circuit Analysis
Lecture: 54 contact hours
Corequisite: ELECTR 111
This is a comprehensive course in direct current circuit analysis including Ohm's law, series and parallel circuit analysis, voltage and current dividers, DC meters, Kirchhoff's laws, magnetic circuits, and network theorems.
Associate Degree Applicable
Transfers to both UC/CSU

ELECTR 111 1 Unit
Direct Current Circuit Laboratory
Lab: 54 contact hours
Corequisite: ELECTR 110
This course is the laboratory complement to ELECTR 110 including experiments reinforcing the theory of electricity and the necessary technical skills.
Associate Degree Applicable
Transfers to both UC/CSU

ELECTR 115 3 Units
Alternating Current Circuit Analysis
Lecture: 54 contact hours
Prerequisite: ELECTR 110 and ELECTR 111
Corequisite: ELECTR 116
This course is an in-depth analysis of alternating current circuits to include AC generation and transformation, inductance and inductive circuits, capacitance and capacitive circuits, time constants, rectangular and polar notation, AC circuit analysis, resonance, and filters.
Associate Degree Applicable
Transfers to both UC/CSU

ELECTR 116 1 Unit
Alternating Current Circuit Laboratory
Lab: 54 contact hours
Prerequisite: ELECTR 110 and ELECTR 111
Corequisite: ELECTR 115
This course is the laboratory complement to ELECTR 115 including skill training in reading and interpreting measurements on an oscilloscope, using QT boards, function generators, and other test equipment.
Associate Degree Applicable
Transfers to both UC/CSU

ELECTR 155 3 Units
Electronic Drawing and Assembly
Lecture: 36 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 110
This course covers electronic schematic capture, simulation, export to printed circuit board design, layout, and auto-routing software. It includes basic Computer Aided Design (CAD) drafting, block diagrams, library component templates, and printed circuit board (PCB) design, fabrication, and assembly, using with through-hole and surface-mount technology and devices (SMT and SMD).
Associate Degree Applicable
Transfers to CSU only

ELECTR 220C 3 Units
FCC Rules and Regulations
Lecture: 54 contact hours
This course is a review of the requirements and questions for the General Radiotelephone Operator's License offered by the Federal Communications Commission.
Associate Degree Applicable
Transfers to CSU only

ELECTR 230 3 Units
Semiconductor Devices
Lecture: 54 contact hours
Prerequisite: ELECTR 110
This course is a study of semiconductor devices including the chemistry and physics of the structure of the atom and the operation of semiconductor devices based on energy level analysis.
Associate Degree Applicable
Transfers to CSU only

ELECTR 235 4 Units
Solid State Circuit Analysis
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 230
This course covers an analysis of discrete solid-state circuits and their design including diodes, circuit configurations, amplifiers and amplification, biasing techniques, feedback principles, FETs, photo devices, and evaluation of designed circuits.
Associate Degree Applicable
Transfers to CSU only

ELECTR 250C 4 Units
Radio Transmitters, Receivers and Antennas
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 115 and ELECTR 116
In this course, students explore topics of electronic communications, such as the electromagnetic frequency spectrum, frequency bands, analog and digital modulation, digital data, antennas, transmission lines and loads, government services and fiber optics. Exercises include diagramming modern transmitter and receiver components, plotting impedances, and making line and load conversions.
Associate Degree Applicable
Transfers to CSU only

ELECTR 255C 4 Units
Telephone and Data Networking
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 115 and ELECTR 116
This course includes telephone topology with emphasis on the Open System Interconnection (OSI) model, telephony color code, tools, patch panels, phone wiring and installation, voice and data block wiring, installation, and programming/ troubleshooting a digital key system and network.
Associate Degree Applicable
Transfers to CSU only

ELECTR 257C 4 Units
Navigation and Communication Systems
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 250C
This course covers the bench test, installation and ramp test of transmitter and receiver systems and their operating principles. Systems include Auto Direction Finder, Very High Frequency Omnirange, LORAN-C, Omega, INS, DME, ILS, VHF communication, HF communication, FM transceivers and transponder.
Associate Degree Applicable
Transfers to CSU only

ELECTR 265 4 Units
Digital Logic Design
Lecture: 54 contact hours
Lab: 54 contact hours
This course covers combinational logic utilizing Boolean algebra and the binary numbering system. Topics include Karnaugh maps, truth tables, coding, switching circuits, converters, logic circuit elements, timers, digital-to-analog and analog-to-digital conversions, decoders, multiplexers, demultiplexers, and displays.
Associate Degree Applicable
Transfers to CSU only

ELECTR 266 4 Units
Microprocessor Technology with Assembly Language
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 265
This course covers the fundamental principles of microprocessors and microcontrollers. The architecture of the 8051 series microcontroller is highlighted along with its' operation and applications in embedded systems. Students make use of assembly language and C language to interface with both analog and digital circuitry. Software simulation tools and microcontroller trainer boards are used in lab exercises and a final project.
Associate Degree Applicable
Transfers to CSU only

ELECTR 270 4 Units
Linear Integrated Circuit Analysis
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 115 and ELECTR 116
This course is a review of bipolar transistor fundamentals and differential amplifiers with emphasis on inner connections and circuit designs using integrated circuit operational amplifiers, phase-lock loops, and current differentiating amplifiers. Includes breadboarding and evaluation of various types of active linear and pulse circuits involving operational amplifiers and phase-lock loops.
Associate Degree Applicable
Transfers to CSU only

ELECTR 280C 4 Units
Computer Operation and Maintenance
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 266
This course provides a working knowledge of the principles and analysis techniques applicable to computer operations and maintenance. It includes the theory and experience necessary to understand and analyze computer circuitry as needed for entry-level work in the computer and electronics industry.
Associate Degree Applicable
Transfers to CSU only

ELECTR 290C 4 Units
Industrial Computers and Robotics Maintenance
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: ELECTR 266
This course is a comprehensive study of computers and robots used in industry. Including diagnostics and programming for controlling robots, machines and medical equipment.
Associate Degree Applicable
Transfers to CSU only

ELECTR 600 Noncredit
Preparation for DC Circuit Certification
Lecture: 54 contact hours
This noncredit electronics technology course prepares students with the specific skills and knowledge in the field of Direct Current (DC) processes and circuits. This course prepares students to take the DC Basics Certification Exam with the Electronics Technicians Association (ETA).

ELECTR 601 Noncredit
Preparation for AC Basics Certification
Lecture: 54 contact hours
This noncredit electronics technology course prepares students with the specific skills and knowledge in the field of AC circuits. This course prepares students to take the AC Basics Certification Exam with the Electronics Technicians Association (ETA).

ELECTR 602 Noncredit
Preparation for Analog Electronics Certification
Lecture: 108 contact hours
This noncredit electronics technology course prepares students with the specific skills and knowledge in the field of analog processes and circuits. This course prepares students to take the Analog Electronics Certification Exam with Electronics Technicians Association (ETA).

ELECTR 603 Noncredit
Preparation for Digital Basics Certification
Lecture: 54 contact hours
This noncredit electronics technology course prepares students with the specific skills and knowledge in the field of digital processes and circuits. This course prepares students to take the Digital Basics Certification Exam with the Electronics Technicians Association (ETA).

ELECTR 604 Noncredit
Preparation for Comprehensive Electronics Certification
Lecture: 54 contact hours
This noncredit electronics technology course prepares students with the specific skills and knowledge in the field of comprehensive knowledge of motors, generators, control circuits, circuit protection, and power distribution. This course prepares students to take the Comprehensive Electronics Certification with the Electronics Technicians Association (ETA).

ELECTR 620 Noncredit
Introduction to Computer Networking
Lecture: 54 contact hours
Lab: 54 contact hours
This noncredit electronics technology course prepares students to take the ETA (Electronics Technicians Association International) STS-CN industry certification. The course covers wire and wireless local area network basics, Internet/VoIP services and security, hardware and software installation, and cabling distribution.

ELECTR 621 Noncredit
Security, Alarm, and Surveillance Systems
Lecture: 54 contact hours
Lab: 54 contact hours
This noncredit electronics technology course prepares students to take the ETA (Electronics Technicians Association International) STS-SS industry certification. The course covers closed-circuit television (CCTV) system, security and fire alarm system, Voice-over-Internet Protocol (VoIP), security cameras, smart locks, and smart access control.

ELECTR 622 Noncredit
Smart Environmental Controls
Lecture: 54 contact hours
Lab: 54 contact hours
This noncredit electronics technology course prepares students to take the ETA (Electronics Technicians Association International) STS-EC industry certification. The course covers smart lighting, smart thermostats, smart plugs and switches, smart HVAC, and carbon monoxide and smoke detectors, and other miscellaneous smart devices.

ELECTR 623 Noncredit
Audio-Visual Entertainment Systems
Lecture: 54 contact hours
Lab: 54 contact hours
This noncredit course prepares students to take the ETA (Electronics Technicians Association International) STS-AV industry certification. The course covers smart televisions and projectors, HD, UHD, LED, and OLED television technologies, wireless smart speakers, Wi-Fi screencasting, audio and HD cabling, amplifiers and receivers, surround sound speaker systems and connectors, rackmounts, and other accessories.

TECALC 087 4 Units
Technical Calculations
Lecture: 72 contact hours
This course covers practical use and applications of technical calculations most commonly utilized in the trades and industry. Topics include electrical measurements, temperature, volume, weight, and positioning including the number line, working with dedicated formula, applied problems, geometric principles, graphs, right triangles, coordinate systems, and scientific and engineering notation. Concepts, techniques, and applications of arithmetic and elementary algebra emphasizing applications to practical problems. Interactive and traditional problem-solving methods. Class interactive group exercises applying mathematical techniques to various applications and real-world problems. A course in mathematical problems is frequently used by students enrolled in the trades and industrial and engineering programs. Problems are drawn from the industrial field.
Associate Degree Applicable