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NARTE and FCC approved test site

http://www.arc.losrios.edu/~electron

Degree: A.S. - Electronic Systems Technology
A.S. - Mechatronics
Certificates: Advanced Electronics and Telecommunications
Biomedical Equipment Technology
Digital Home Technology Integration
Digital Repair & Upgrade Technician
Electronic Systems Technology
Fiber Optics
Mechatronics
Robotics
Telecommunication Specialist
Department Certificate:
Basic Electronics and Telecommunications
Basic Mechatronics

Electronic equipment is present everywhere in our lives. From computerized traffic signals to personal computers and cellular telephones, modern electronic systems make our everyday lives easier, safer, and more efficient. Electronic technicians design, develop, build, install, repair and maintain many different types of sophisticated electronic devices.

The American River College Electronics program combines broad based Electronic and Telecommunications training with the newest specialty areas (such as Robotics, Fiber Optics, Programmable Interface Controllers and Stamp Microcontrollers). By working closely with our industry partners we ensure our curriculum is relevant and meets industry current and future needs. This relevant and up-to-date education prepares graduates for excellent career opportunities in the Electronics, Robotics or Telecommunications fields.

American River College is an official NARTE (National Association of Radio and Television Engineers) Federal Communication Commission (FCC) test site and offers an FCC license preparation course.

DEGREES AND CERTIFICATES

Electronic Systems Technology Degree and Certificate

The Electronics Systems Technology Degree or Certificate combines broad-based electronic and telecommunications training with specialty areas such as robotics, fiber optics, programmable interface controllers (PICs), and stamp micro-controllers.

Student Learning Outcomes

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

- design and build several of the most common circuits used in electronics technology.
- calculate the mathematical relationships among voltage, current, resistance, capacitance, inductance, reactance, frequency, and phase angle as they relate to electronic circuits.
- analyze aviation, marine, and commercial communication systems that are covered in the FCC General Class Radiotelephone license examination.
- analyze operating and defective electronic circuits by interpreting data from a variety of test and measurement equipment.
- differentiate and diagram schematic symbols used in electronic and electrical industrial applications.
- use common hand tools in the mechanical installation of copper and fiber optic cabling used in sophisticated communication systems.
- research and interpret basic electronic components using manufacturers' data manuals, library resources, and the Internet.
- evaluate electrical parameters using various types of test and measurement equipment used in the analysis of power supply, amplifier, and general electronic circuits.

Career Opportunities

This degree or certificate provides students with the knowledge to successfully enter a variety of electronics and telecommunication careers. Working closely with our industry partners and contacts ensures our curriculum is relevant and meets the current and future needs of the Electronics and Telecommunications Industry. American River College is an official test site of the National Association of Radio and Telecommunication Engineers (NARTE) for the Federal Communication Commission (FCC) General Radio Telephone License. Obtaining the degree or certificate improves the opportunities for quality employment and career advancement.

See **losrios.edu/gainful-emp-info/gedt.php?major=011564C01** for Gainful Employment Disclosure.

Requirements for Degree or Certificate **36 Units**

1st Semester - Basic Certificate		
ET 115	Fiber Optics and Telecommunication Cabling	4
ET 302	Principles of Electricity and Electronics	4
ET 308	Technical Soldering Practices and Techniques	2
Second Semester - Advanced Certificate:		
ET 312	Mathematics for Circuit Analysis	3
ET 322	Semiconductors and Nanotechnology	4
Following Semesters:		
ET 253	Industrial Communication Systems Support	4
ET 335	Integrated Circuits with Computer Applications	4
ET 380	Introduction to Electronic Communications	4
ET 381	Electronic Communication Regulations	3
ET 420	Microcontrollers and Digital Signal Processors	4

Associate Degree Requirements: The Electronic Systems Technology 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 ARC graduation requirements.

Mechatronics Degree and Certificate

This degree or certificate provides training in a multi-disciplinary field focusing on industrial automation. Topics include electricity, electronics, industrial motor controls, programmable logic controllers, robotics, AC/DC drives, mechanical design, and manufacturing technologies.

Student Learning Outcomes

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

- integrate the principles of mechanical, electronic, and electrical technologies into the design of mechatronic systems.
- evaluate mechanical and electrical solutions to technological problems.
- apply industry-appropriate design techniques to develop technical design documents from a conceptual design.
- design robotic and machine automation systems using mechatronic principles.
- evaluate welding projects in accordance with welding procedures and specifications.
- contrast DC (direct current), AC (alternating current), brushless, servo, and stepper motor operation.
- create technical documentation/presentations of models from the mechanical engineering discipline in both technically correct and visually pleasing solid, orthographic, and section view formats.
- design programmable logic controller (PLC) programs demonstrating input/output capabilities.
- design programs for an operator interface terminal (OIT) demonstrating input/output capabilities.

Career Opportunities

This degree or certificate prepares the student for the following technical and supervisory career opportunities: industrial mechanical/electrical systems technician, food processing machine service technician, facilities systems technician, waste water systems technician, manufacturing coordinator, field service technician, and mechanical electrical machine systems installer.

See **losrios.edu/gainful-emp-info/gedt.php?major=011562C01** for Gainful Employment Disclosure.

Requirements for Degree or Certificate		27 Units
1st Semester:		
DESGN 100	Introduction to Computer Aided Drafting and Design (CADD)	3
ET 302	Principles of Electricity and Electronics	4
WELD 300	Introduction to Welding	3
2nd Semester:		
DESGN 302	Technical Documentation with CADD	3
ET 197	Introduction to Mechatronics	4
Following Semesters:		
ET 199	Advanced Mechatronics	4
DESGN 310	Graphic Analysis and Documentation	3
DESGN 328	Engineering Modeling and Design	3

Associate Degree Requirements: The Mechatronics 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 ARC graduation requirements.

Advanced Electronics and Telecommunications Certificate

This certificate provides training in electronic system component identification and characteristics, semiconductor theory and application, power supply design and operation, telecommunication copper and fiber optic systems, the mathematics for circuit analysis, and advanced troubleshooting. It is designed to be completed in two semesters.

Student Learning Outcomes

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

- analyze circuit operating characteristics by applying Ohm's, Watt's, and Kirchhoff's laws.
- research and interpret basic electronic components using manufacturers' data manuals, library resources, and the Internet.
- analyze and apply mathematics, including logarithms and decibels to determine, analyze, and control outputs when problem solving transistor and field effect transistor (FET) circuits.
- evaluate electrical parameters using various types of test and measurement equipment used in the analysis of power supply and amplifier circuits.
- apply mathematics and semiconductor theory to identify, evaluate, and troubleshoot electronic circuits.
- calculate the mathematical relationships among voltage, current, resistance, capacitance, inductance, reactance, frequency, and phase angle as they relate to electronic circuits.
- construct and test circuits on prototyping boards and printed circuit boards.
- design and simulate circuits in software.

Career Opportunities

This certificate program enables students to find employment in the electronics industry or to progress up the career ladder. Skills development in the critical areas along with electronics and telecommunications theory and laboratory practice make this an ideal certificate for those wishing to upgrade and update their electronics skills.

See **losrios.edu/gainful-emp-info/gedt.php?major=011502C01** for Gainful Employment Disclosure.

Requirements for Certificate		17 Units
1st Semester - Basic Certificate		
ET 115	Fiber Optics and Telecommunications Cabling	4
ET 302	Principles of Electricity and Electronics	4
ET 308	Technical Soldering Practices and Techniques	2
Second Semester - Advanced Certificate:		
ET 312	Mathematics for Circuit Analysis	3
ET 322	Semiconductors and Nanotechnology	4

Biomedical Equipment Technology Certificate

This certificate covers the theory, operation, maintenance, troubleshooting, and certification of biomedical equipment used in hospitals, medical device manufacturers, or other service organizations. It includes an in-depth study of frequently used medical equipment.

(continued on next page)

(Biomedical Equipment Technology Certificate continued)

Student Learning Outcomes

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

- evaluate the data from basic preventive maintenance tests on the following equipment: multi-parameter physiological monitor, electrocardiogram (ECG) machine, blood pressure monitor, defibrillator, pulse oximeter, infusion pump, and electrosurgical unit.
- distinguish and list various medical imaging technologies.
- set up standard electrical measurement tools and differentiate the uses for calibration and troubleshooting of medical equipment.
- set up the following equipment: multi-parameter physiological monitor, ECG machine, blood pressure monitor, defibrillator, pulse oximeter, infusion pump, and electrosurgical unit.
- categorize biopotentials and electrodes as they relate to basic human anatomy and physiology systems.
- associate the applicable regulation with the regulating organizations.
- list and compare the different types of bioelectric amplifiers, signal processing circuits, and isolation circuits.
- compare and contrast the protocols for working in the operating room and special care units in the hospital.

Career Opportunities

This program prepares electronics technology students for a biomedical technician internship or trainee position.

See **losrios.edu/gainful-emp-info/gedt.php?major=010950C01** for Gainful Employment Disclosure.

Requirements for Certificate		20 Units
ET 302	Principles of Electricity and Electronics	4
ET 312	Mathematics for Circuit Analysis	3
ET 322	Semiconductors and Nanotechnology	4
ET 425	Introduction to Biomedical Equipment Technology	4
ET 426	Advanced Biomedical Equipment Technology	4
A minimum of 1 unit from the following:		1
ET 260	Introduction to Medical Ultrasound Equipment (0.5)	
ET 261	Introduction to Biomedical Equipment Networking (0.5)	
ET 262	Introduction to Respiratory Therapy Ventilators (0.5)	
ET 263	Introduction to Medical X-ray Imaging Equipment (1)	

Digital Home Technology Integration Certificate

This certificate provides training to configure, integrate, maintain, and troubleshoot electronic and digital home integration systems. Coursework provides the essential skills for residential networking concepts, components, and information on home network installation.
This includes techniques to install, trim, terminate, and troubleshoot cabling systems. In addition, it provides the training and skills necessary to integrate audio, security and environmental controls in a complete system.

Student Learning Outcomes

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

- design a home data network
- construct a home telephone network
- evaluate and troubleshoot a home network
- assemble a home audio and video network
- build a wireless home network
- certify a homes data and telephone network
- set up a security and fire alarm system in a home
- apply industry standards to system design for a home

Career Opportunities

The Digital Home Technology Integrator certificate prepares individuals to design, install, and support residential networks and home integration for employment in the home technology industry. This program develops the technicians's ability to configure, integrate, maintain and troubleshoot home theater, music, security, and home networks.

Requirements for Certificate		20 Units
ET 115	Fiber Optics and Telecommunication Cabling	4
ET 253	Industrial Communication Systems Support	4
ET 302	Principles of Electricity and Electronics	4
ET 385	Digital Home Technology Integration	4
ET 388	Fiber Optics	4

Digital Repair and Upgrade Technician Certificate

The Digital Repair and Upgrade Technician certificate combines basic electronics theory and application with computer repair and support skills. Topics including high-tech soldering along with component and system level electronics are focused on in the electrical area. Computer repair skills and support are covered in the computer area.

Student Learning Outcomes

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

- apply the rules of electrical safety for working with personal computers and associated equipment.
- describe the terminology used for working with personal computers.
- categorize the components inside a personal computer.
- upgrade and install new and updated software programs.
- research and download updated system drivers from the Internet.
- compare and evaluate solder connections in accordance with industry standards.
- evaluate operational characteristics of electronic components and devices operating under normal and abnormal conditions.
- differentiate resistance, capacitance and inductive devices and their operating characteristics.
- analyze and troubleshoot basic electronic circuits.
- research and interpret basic electronic components using manufacturers' data manuals, library resources, and the Internet.

Career Opportunities

The Digital Repair and Upgrade Technician certificate prepares the student for a wide variety of jobs in the computer industry, such as, network communication cable installer, interface troubleshooter, and fiber optic installer.

Requirements for Certificate		14-17 Units
CISC 320	Operating Systems	1
CISC 361	Microcomputer Support Essentials - Preparation for A+ Certification	3
CISC 363	Microcomputer Support Technical - Preparation for A+ Certification	3
ET 253	Industrial Communication Systems Support	4
ET 298	Work Experience in Electronics Technology	1 - 4
ET 308	Technical Soldering Practices and Techniques	2

Fiber Optics Certificate

The Fiber Optics certificate is an introduction into fiber optics technology. Topics include fusion and mechanical splicing, fiber connectivity, optical time domain reflectometer (OTDR), and other specialized test equipment operations. System design, installation, troubleshooting, and repair are emphasized. Courses in communication theory and copper cabling are included in the certificate, producing a technician with a wide variety of skills.

Student Learning Outcomes

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

- define the terminology used with single mode fiber optic cable.
- apply correct safety procedures when working with high power fiber optic modules and test equipment.
- calculate the attenuation in a complete fiber optic communication system.
- inspect and identify fiber optic system problems.
- evaluate communication system components for a given application.
- compare fiber optic component specifications using manufacturers' data manuals, reference books, and the Internet.
- perform inspection and quality control of fusion and mechanical fiber optic splices.

Career Opportunities

The Fiber Optic certificate prepares the student to obtain entry level employment in a wide variety of positions in the telecommunication and fiber optic industry. It is also valuable for people working in the industry to upgrade their skill level to include the newest advancements in fiber technology.

See **losrios.edu/gainful-emp-info/gedt.php?major=011570C01** for Gainful Employment Disclosure.

Requirements for Certificate		12 Units
ET 115	Fiber Optics and Telecommunication Cabling	4
ET 302	Principles of Electricity and Electronics	4
ET 388	Fiber Optics	4

Robotics Certificate

The Robotics certificate provides an overview of electronics and robotic theory and application, programming, design, and modification. Electronics theory and application are stressed along with sensors and controllers, an important part of the next generation of robotics. Various robotic platforms are used to give a wide understanding of all types of current and future systems.

Student Learning Outcomes

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

- identify and describe the terminology used when working with Parallax stamp micro-controllers.
- program and troubleshoot the Parallax stamp micro-controller using P-Basic language.
- evaluate operational characteristics of electronics components and devices operating under normal and abnormal conditions.
- synthesize and analyze electronic circuitry using computer electronic simulation software.
- compare and evaluate solder connections in accordance with industry standards.
- calculate speed and acceleration of robotic motion.
- compare DC motor and servo motor characteristics.
- analyze a fluid power schematic diagram and design a simple hydraulic circuit.

Requirements for Certificate		12 Units
ET 192	Introduction to Robotics	2
ET 194	Intermediate Robotics	2
ET 196	Sensors, Measurement, and Control	2
ET 302	Principles of Electricity and Electronics	4
ET 308	Technical Soldering Practices and Techniques	2

Telecommunication Specialist Certificate

The Telecommunication Specialist certificate provides both theory and hands-on application using fiber optics, coaxial cable, and CAT 6 data cable. All aspects of communication systems are covered including antennas, transmitters and receivers, transmission lines, and signal propagation. System design and troubleshooting are also included.

Student Learning Outcomes

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

- evaluate potential problems associated with electrostatic discharge (ESD).
- analyze and troubleshoot basic electronic circuits.
- compare and contrast series and parallel resistive, capacitive, and inductive devices.
- analyze the differences between surface mount techniques and through-hole techniques.
- analyze and describe the components of a complete telecommunication system.
- design an office building telecommunication system using fiber optics and copper cable.
- examine and evaluate the decibel losses and gains in a complete fiber optic communication system.
- assess safety hazards when working with fiber optic systems and associated test equipment.
- perform repairs and adjustments to electronic communication systems according to factory specifications.
- install epoxy, hotmelt, anaerobic, and mechanical connectors on multimode fiber optic cable.
- prepare cost estimates for fiber optic and copper network installation using computer software.
- identify and diagram schematic symbols used in industrial electronic and electrical applications.
- analyze aviation, marine and commercial communication systems that are covered in the FCC General Class Radiotelephone license examination.
- apply FCC rules and regulations governing commercial, aviation, and marine communication systems to practical communication systems.

Career Opportunities

The Telecommunication Specialist certificate provides training for design, installation, and maintenance of any type of wired or wireless communication systems, such as, remote monitoring, radio frequency (RF) control, radio and television transmitters, public safety and government communication equipment, and fiber optic systems.
See **losrios.edu/gainful-emp-info/gedt.php?major=011571C01** for Gainful Employment Disclosure.

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(Telecommunication Specialist Certificate continued)

Requirements for Certificate		32 Units
1st Semester		
ET 115	Fiber Optics and Telecommunication Cabling	4
ET 302	Principles of Electricity and Electronics	4
ET 308	Technical Soldering Practices and Techniques	2
2nd Semester		
ET 312	Mathematics for Circuit Analysis	3
ET 322	Semiconductors and Nanotechnology	4
Following Semesters		
ET 253	Industrial Communication Systems Support	4
ET 380	Introduction to Electronic Communications	4
ET 381	Electronic Communication Regulations	3
ET 388	Fiber Optics	4

DEPARTMENT CERTIFICATE

Basic Electronics and Telecommunications Certificate

The Basic Electronics and Telecommunication certificate provides training in basic electronics theory and applications, telecommunication copper and fiber optic systems, and surface mount soldering devices (SMD). It also includes schematic symbol interpretation, and basic electronic troubleshooting. The courses required for this certificate can be completed in one semester, making it an ideal stepping stone to the Advanced Electronics and Telecommunications certificate.

Student Learning Outcomes

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

- evaluate potential problems associated with electrostatic discharge (ESD).
- evaluate solder connections in accordance with industry standards.
- analyze the differences between surface mount techniques and through-hole techniques.
- inspect SMDs using a high-magnification observation station.
- diagram schematic symbols used in electronic and electrical industrial applications.
- analyze and troubleshoot basic electronic circuits.
- compare and contrast series and parallel resistive, capacitive, and inductive devices.
- analyze and describe the components in a complete telecommunication system.
- construct connectors and plugs used in telecommunication systems.
- analyze test equipment data to determine the location of a communication system.
- evaluate communication system components and select the best for a given application.
- assess safety hazards when working with telecommunication systems.

Career Opportunities

The Basic Electronics and Telecommunications certificate is designed for anyone wanting to enter the electronics or telecommunications industry. This certificate satisfies the requirements of a variety of entry-level positions, such as, printed circuit board (PCB) assembler, telecommunication field technician, or rework technician.

Requirements for Certificate		10 Units
ET 115	Fiber Optics and Telecommunication Cabling	4
ET 302	Principles of Electricity and Electronics	4
ET 308	Technical Soldering Practices and Techniques	2

Basic Mechatronics Certificate

This certificate provides introductory training in the multidisciplinary field of mechatronics which combines mechanical and electronic technologies. Topics include introductory courses in electronics, programmable logic controllers, basic CAD design, and welding.

Career Opportunities

This certificate prepares students for internships and entry-level employment with local industries using mechatronic and design principles.

Student Learning Outcomes

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

- integrate the basic principles of mechanical, electronic, and electrical technologies into the design of mechatronic systems.
- evaluate mechanical and electrical solutions to technological problems.
- apply basic design techniques to develop technical design documents.
- design basic robotic and machine automation systems using mechatronic principles.
- create and evaluate welding projects in accordance with welding procedures and specifications.

Requirements for Certificate		17 Units
First Semester:		
DESGN 100	Introduction to Computer Aided Drafting and Design (CADD)	3
ET 302	Principles of Electricity and Electronics	4
Second Semester:		
DESGN 302	Technical Documentation with CADD	3
ET 197	Introduction to Mechatronics	4
Any Semester:		
WELD 300	Introduction to Welding	3

Electronics Technology

ET 101 Introduction to Amateur Radio .5 Units
Hours: 9 hours LEC

This course introduces the fundamentals of amateur radio for public and emergency communication. It covers the equipment, procedures, and uses for amateur (Ham) radio.

ET 103 Ham Radio Technician License Preparation 2 Units
Hours: 36 hours LEC

This course covers the fundamentals of amateur radio required to pass the national Association for Amateur Radio Relay League (ARRL) amateur radio operators technician license. Topics include wave theory, operator rules, proper radio operation, electronics review, and regulations.

ET 115 Fiber Optics and Telecommunication Cabling 4 Units
Hours: 54 hours LEC; 54 hours LAB

This course introduces the concepts of telecommunication cable installation and connection practices and standards. It includes the study of commonly used fiber optic and copper cable types and connectors, installation tools, and test equipment. Emphasis is on installation techniques in practical situations. Laboratory activities provide practical hands-on experience in the operation and use of tools and test equipment specific to the telecommunication industry. Field trips may be required.

ET 192 Introduction to Robotics 2 Units
Hours: 36 hours LEC

This course is an introduction to robotics utilizing the Parallax Stamp microcontroller and Boe-Bot robotic vehicle. It explores how robots and microcontrollers interface with common electronic applications. It also investigates unusual and innovative applications for robots and microcontrollers. Field trips may be required.

ET 194 Intermediate Robotics 2 Units
Advisory: ET 192
Hours: 36 hours LEC

This course covers intermediate robotics utilizing various robotic systems such as the Robix and VEX. Topics include the operation and design of robots, hardware component selection, assembly, and software programming of various types of robotic assemblies. Field trips may be required.

ET 196 Sensors, Measurement, and Control 2 Units
Hours: 36 hours LEC

This course is a detailed study of the physical world and the sensors which measure its properties. Signals from these sensors are converted for display and used to control physical properties such as temperature or pressure. Lecture and demonstrations reinforce theory and provide experience in sensor identification and troubleshooting. Microcontrollers are used to simulate industrial situations.

ET 197 Introduction to Mechatronics 4 Units
Prerequisite: ET 302 with a grade of "C" or better
Hours: 54 hours LEC; 54 hours LAB

This course introduces mechatronics, the combination of electronic and mechanical components and systems used in the control and transmission of mechanical power. Topics include the analysis of electric controls, programmable logic controllers (PLCs), electromagnetic devices, sensors, pneumatic devices, and electric motors.

ET 199 Advanced Mechatronics 4 Units
Prerequisite: ET 197 with a grade of "C" or better
Hours: 54 hours LEC; 54 hours LAB

This course continues the study of mechatronics, the combination of electronic and mechanical components and systems used in the control and transmission of mechanical power. Topics include the analysis of electric circuits and controls, operator interface terminals, programmable logic controllers (PLCs), electromagnetic devices, analog and digital measurements, sensors, pneumatic devices, and electric motors.

ET 250 Employability Skills for Technical Careers 2 Units
Same As: AT 107 and WELD 150
Advisory: ENGWR 102 or 103, and ENGRD 116 with a grade of "C" or better; OR ESLR 320, ESLL 320, and ESLW 320 with a grade of "C" or better.
General Education: AA/AS Area III(b)
Hours: 36 hours LEC

This course provides the opportunity to explore technical careers while developing valuable work and life skills. It is an introduction to a variety of technically-related occupations, emphasizing technical careers in the Sacramento area. Activities are designed to enhance personal development, employability skills, and self esteem through leadership, citizenship, and character development. This course is not open to students who have completed AT 107 or WELD 150.

ET 251 Automotive Electronic Accessories and Installation 3 Units
Same As: AT 251
Corequisite: AT 330 or ET 302
Hours: 36 hours LEC; 54 hours LAB

This course covers the principles and processes involved in the installation of mobile entertainment, security, positioning, and other electrical and electronic related systems and components. Safety, circuit diagrams, inspection, wiring, installation, and troubleshooting techniques are covered along with the operational characteristics of the various electrical circuits. This course offers preparation to become a qualified Mobile Electronics Certified Professional (MECP) installer. This course is not open to students who have taken AT 251. Field trips are required.

ET 253 Industrial Communication Systems Support 4 Units
Prerequisite: ET 115 with a grade of "C" or better
Hours: 54 hours LEC; 54 hours LAB

This course covers the operation, repair, and assembly of computers, portable test units (PTU), and communication systems. Safety, terminology, component identification, file management, industry specific hardware and software, and upgrades in industry are among the topics covered. Wired, wireless, voice over IP (VoIP), analog/digital communications, and synchronous optical networks (SONET) are also covered. Field trips may be required.

ET 260 Introduction to Medical Ultrasound Equipment .5 Units
Corequisite: ET 425
Hours: 9 hours LEC

This course provides in-depth training for maintaining ultrasound equipment used in the biomedical field. It covers imaging modes, physical principles, transducers, system block diagrams, common peripherals, Doppler effect, image quality, test equipment, and troubleshooting.

ET 261 Introduction to Biomedical Equipment Networking .5 Units

Advisory: ET 302;
Hours: 9 hours LEC

This course provides an overview of the Digital Information Communication of Medicine (DICOM) system. DICOM is a patient data system for medical devices to communication to the hospital data base. Topics include interface standards, test equipment, troubleshooting, and applications.

ET 262 Introduction to Respiratory Therapy Ventilators .5 Units

Corequisite: ET 425
Hours: 9 hours LEC

This course provides in-depth training for the maintenance of respiratory ventilation machines used in the biomedical field. It covers respiratory ventilator basics, ventilator block diagrams, patient circuits, test equipment, and troubleshooting.

ET 263 Introduction to Medical X-ray Imaging Equipment 1 Unit

Prerequisite: ET 425 with a grade of "C" or better
Hours: 18 hours LEC

This course provides an introduction to the maintenance of medical X-ray imaging equipment. It covers X-ray generators, components of vacuum tube and solid state imaging chains, cameras, digitizing methods, processing, display methods, and radiation safety.

ET 295 Independent Studies in Electronics Technology 1-3 Units

Hours: 54-162 hours LAB

Independent Study is an opportunity for the student to extend classroom experience in this subject, while working independently of a formal classroom situation. Independent study is an extension of work offered in a specific class in the college catalog. To be eligible for independent study, students must have completed the basic regular catalog course at American River College. They must also discuss the study with a professor in this subject and secure approval. Only one independent study for each catalog course will be allowed.

ET 298 Work Experience in Electronics Technology 1-4 Units

Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.
Enrollment Limitation: Students must be in a paid or unpaid internship, volunteer position, or job related to the electronics industry with a cooperating site supervisor. Students are advised to consult with the Electronics Technology Department faculty to review specific certificate and degree work experience requirements.
General Education: AA/AS Area III(b)
Hours: 60-300 hours LAB

This course provides students with opportunities to develop marketable skills in preparation for employment or advancement within the electronics industry. It is designed for students interested in work experience and/or internships in associate degree level or certificate occupational programs. Course content includes understanding the application of education to the workforce, completion of Title 5 required forms which document the student's progress and hours spent at the work site, and developing workplace skills and competencies. During the semester, the student is required to attend a weekly orientation and 75 hours of related paid work experience, or 60 hours of unpaid work experience for one unit. An additional 75 or 60 hours of related work experience is required for each additional unit. First-time participants are required to attend a weekly orientation and a final meeting. Returning participants are required to attend the first class meeting, a mid-semester meeting, and a final meeting and may meet individually with the instructor as needed to complete a work site observation and all program forms, receive updates, and assignments. Students may take up to 16 units total across all Work Experience course offerings. This course may be taken up to four times when there are new or expanded learning objectives. Only one Work Experience course may be taken per semester.

ET 302 Principles of Electricity and Electronics 4 Units

Course Transferable to CSU
Hours: 54 hours LEC; 54 hours LAB

This introductory course explores the field of electronics and electricity. Topics include the theory of AC, DC, Ohm's law, inductance, and capacitance. The use of electronic simulation software and hands on lab experiments using industry instruments reinforces theory. Field trips to local electronics industries may be required.

ET 303 Energy and Sustainability 3 Units

Same As: ENERGY 303 and NATR 303
Advisory: MATH 120, 125, 129, 133 or higher; NATR 300, or an equivalent transferable life science course; and Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300, OR ESLR 340 AND ESLW 340.
General Education: AA/AS Area IV
Course Transferable to CSU
Hours: 54 hours LEC

This course investigates fundamentals of energy and impacts of energy systems on society and the environment. It explores energy resources, efficiency, conservation, and emerging technologies. Specifically addressed are mechanics, advantages, disadvantages, and sustainability of current and future energy systems. This course also focuses on economic, cultural, political, and environmental aspects of energy production and consumption in the context of the built environment, transportation, food systems, manufacturing, and public services. Field trips may be required. This course is not open to students who have completed ENERGY 303 or NATR 303.

ET 308 Technical Soldering Practices and Techniques 2 Units

Advisory: ET 115 and 302
Course Transferable to CSU
Hours: 18 hours LEC; 54 hours LAB

This course provides training in the standards, processes, and techniques related to the field of lead and lead-free soldering. Emphasis is placed on the differences between lead and lead-free soldering processes. Topics include safety, Electrostatic Discharge (ESD), Printed Circuit Board (PCB) components and assembly, electronic components and identification, lead and lead-free soldering and de-soldering techniques in Plated Through Hole (PTH), Surface Mount Device/Technology (SMD/SMT), and fine to ultra fine-pitch soldering. Field trips may be required.

ET 312 Mathematics for Circuit Analysis 3 Units

Course Transferable to CSU
Hours: 54 hours LEC

The foundations for the analysis of electrical and electronic circuits are covered in this course. Topics include the analysis of direct current (DC), alternating current (AC), transformer, capacitor, inductor, and energy conversion circuits.

ET 322 Semiconductors and Nanotechnology 4 Units

Prerequisite: ET 302 with a grade of "C" or better
Corequisite: ET 312
Course Transferable to CSU
Hours: 54 hours LEC; 54 hours LAB

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. Field trips may be required.

ET 335 Integrated Circuits with Computer Applications 4 Units

Prerequisite: ET 312 and 322 with grades of "C" or better
Course Transferable to CSU
Hours: 54 hours LEC; 54 hours LAB

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). Field trips may be required.

ET 369 The Design and Fabrication of Electronics Projects 2 Units

Prerequisite: ET 322 with a grade of "C" or better
Course Transferable to CSU
Hours: 18 hours LEC; 54 hours LAB

This course provides an opportunity to design and build advanced projects. It includes work on approved electronics projects outside the scope of typical classroom applications. It covers the process of planning, design, prototyping, and fabrication while building an actual working project. Completed projects are entered in county and statewide technology contests such as the California State Fair Industrial Technology competition. A completed project is a course requirement. Projects can be completed individually or in teams. Field trips are required.

ET 380 Introduction to Electronic Communications 4 Units

Prerequisite: ET 312 and 322 with grades of "C" or better
Course Transferable to CSU
Hours: 54 hours LEC; 54 hours LAB

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.

ET 381 Electronic Communication Regulations 3 Units

Prerequisite: ET 312 and 322 with grades of "C" or better
Advisory: ET 380
Course Transferable to CSU
Hours: 54 hours LEC

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. Field trips may be required.

ET 385 Digital Home Technology Integration 4 Units

Prerequisite: ET 115 with a grade of "C" or better
Course Transferable to CSU
Hours: 54 hours LEC; 54 hours LAB

This course covers the fundamentals of Home Technology Integration (HTI). It includes the study of and practical experience in installation, integration, and troubleshooting of entertainment, voice, security, data, and networking systems found in the home or small office. Field trips may be required.

ET 388 Fiber Optics 4 Units

Prerequisite: ET 302 with a grade of "C" or better
Advisory: ET 380
Course Transferable to CSU
Hours: 54 hours LEC; 54 hours LAB

This course in fiber optics covers optical theory and operation including the complete fiber optic communication system. It includes fiber optic terminology and instruction in the use of tools and equipment associated with fiber optic installation and maintenance. Tests of the fiber optic systems are performed using sophisticated equipment such as optical power meters and optical time domain reflectometers (OTDR). It also includes system design and troubleshooting procedures. A field trip may be required.

ET 420 Microcontrollers and Digital Signal Processors 4 Units

Prerequisite: ET 312 and 322 with grades of "C" or better
Advisory: ET 335
Course Transferable to CSU
Hours: 54 hours LEC; 54 hours LAB

This course is an in-depth study of microcontrollers and digital signal processors (DSP). The focus is on digital concepts, such as data flow, internal architecture, memory, data converters, special registers, and the interfacing of input/output devices, sensors, and motors. Field trips may be required.

ET 421 Advanced Electronic Communications 4 Units

Prerequisite: ET 253 and 380 with grades of "C" or better
Course Transferable to CSU
Hours: 54 hours LEC; 54 hours LAB

This course covers advanced analog and digital electronic communications including digital two-way radio, cellular, microwave, satellite, and broadcast communications. Topics include digital radio frequency theory, digital transmitters and receivers, P25 digital radio, antennas, software-defined radios, and related industry test equipment. Field trips may be required.

ET 425 Introduction to Biomedical Equipment Technology 4 Units

Prerequisite: ET 302 with a grade of "C" or better
Course Transferable to CSU
Hours: 72 hours LEC

This course covers the fundamentals of biomedical equipment and the responsibilities of electronics technicians in the medical device service industry for hospitals, medical device manufacturers, or other service organizations. It includes a detailed study of the theory, operation, and maintenance of hospital equipment, systems and procedures, and the related electronic systems. Additional topics include basic anatomy and physiology as they relate to the biomedical equipment. Field trips are required.

ET 426 Advanced Biomedical Equipment Technology 4 Units

Prerequisite: ET 425 with a grade of "C" or better
Course Transferable to CSU
Hours: 54 hours LEC; 54 hours LAB

This course covers the operation, maintenance, troubleshooting, and certification of biomedical equipment used in the medical device industry. It includes an in-depth, hands-on study of frequently used medical equipment preparing electronic technology students for a biomedical technician internship or trainee position in a hospital, medical device manufacturer, or other service organization. Field trips are required.

ET 490 Advanced Student Projects Laboratory 2 Units

Prerequisite: ET 335 or 380 with a grade of "C" or better
Course Transferable to CSU
Hours: 108 hours LAB

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

ET 495 Independent Studies in Electronics Technology 1-3 Units

Prerequisite: None
Course Transferable to CSU
Hours: 54-162 hours LAB

Independent Study is an opportunity for the student to extend classroom experience in this subject, while working independently of a formal classroom situation. Independent study is an extension of work offered in a specific class in the college catalog. To be eligible for independent study, students must have completed the basic regular catalog course at American River College. They must also discuss the study with a professor in this subject and secure approval. Only one independent study for each catalog course will be allowed.