

Area: Technical Education
 Dean: Gabriel Meehan
 Phone: (916) 484-8354
 Counseling: (916) 484-8572
 arc.losrios.edu/~electron
 NARTE and FCC approved test site



Degree: A.S. - Electronic Systems Technology
 A.S. - Mechtronics
 Certificates: Electronic Systems Technology
 Mechtronics
 Telecommunication Specialist
 Certificates of Completion:
 Advanced Electronics and Telecommunications
 Basic Electronics and Telecommunications
 CMOS Mask Design
 Digital Repair & Upgrade Technician
 Fiber Optics
 Robotics

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.

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 microcontrollers.

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 electronic communication systems.
- Develop skills in building, testing, analyzing, and troubleshooting electronic communication systems.
- Apply theory and mathematics for evaluating the design, operation, and troubleshooting of integrated amplifier circuits such as comparators and operational amplifiers.
- Interpret data from a variety of test and measurement equipment used in analysis of electronic control systems.
- Identify and diagram schematic symbols used in electric and electrical industrial applications.
- Diagram and evaluate the components of Global Positioning Systems (GPS), satellite receivers and transmitters, AM and FM transmitters and receivers, and fiber optic communication links.

- Compare the differences between a mechanical splice and a fusion splice when working with fiber optic cable.
- Employ common hand tools in the mechanical installation of a sophisticated communication system.
- 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

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. Included in the electronics program is an FCC license preparation course. Obtaining the degree or certificate improves the opportunities for quality employment and career advancement.

| Requirements for Degree | 37 Units |
|-------------------------|--|
| ET 112 | Communications Units.....3 |
| ET 115 | Fiber Optics and Telecommunication Cabling4 |
| ET 143 | Computer Upgrade, Repair, and Assembly2 |
| ET 302 | Principles of Electricity and Electronics4 |
| ET 307 | High Tech Soldering and Fabrication Techniques2 |
| ET 310 | Mathematics for DC Circuit Fundamentals, Part I1.5 |
| ET 311 | Mathematics for AC Circuit Fundamentals, Part II.....1.5 |
| ET 322 | Semiconductor Devices and Applications5 |
| ET 335 | Integrated Circuits with Computer Applications5 |
| ET 380 | Introduction to Electronic Communications4 |
| ET 420 | Microcontrollers and Digital Signal Processors5 |

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.

Requirements for Certificate **37 Units****1st Semester**

| | | |
|--------|--|---|
| ET 115 | Fiber Optics and Telecommunication Cabling | 4 |
| ET 302 | Principles of Electricity and Electronics (4) | 4 |
| ET 307 | High Tech Soldering and Fabrication Techniques | 2 |

Other Semesters

| | | |
|--------|---|-----|
| ET 112 | Communications Units..... | 3 |
| ET 143 | Computer Upgrade, Repair, and Assembly | 2 |
| ET 310 | Mathematics for DC Circuit Fundamentals, Part I | 1.5 |
| ET 311 | Mathematics for AC Circuit Fundamentals, Part II..... | 1.5 |
| ET 322 | Semiconductor Devices and Applications | 5 |
| ET 335 | Integrated Circuits with Computer Applications | 5 |
| ET 380 | Introduction to Electronic Communications | 4 |
| ET 420 | Microcontrollers and Digital Signal Processors..... | 5 |

Mechtronics Degree and Certificate

This degree or certificate provides training in a multi-disciplinary field of which the primary focus is industrial automation. Topics such as electricity, electronics, industrial motor controls, programmable logic controllers, robotics, AC/DC drives, mechanical design, and manufacturing technologies are covered.

Student Learning Outcomes

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

- integrate the principles of mechtronics to the design of mechatronic systems.
- evaluate mechanical and electrical solutions to solve technological problems.
- analyze data to create trouble shooting processes.
- apply mechatronic principles to the field of robotics and machine automation.

Career Opportunities

This degree or certificate prepares the student for the following career opportunities: Industrial mechanical/electrical systems technician, food processing machine service technician, facilities systems technician, waste water systems technician, manufacturing coordinator, field service technician, mechanical electrical machine systems installer. Obtaining the degree or the certificate improves the opportunities for quality employment and career advancement.

Requirements for Degree or Certificate **33-36 Units****1st Semester**

| | | |
|----------|---|---|
| ET 302 | Principles of Electricity and Electronics | 4 |
| DESN 100 | Introduction to Computer Aided Drafting and Design (CADD) | 3 |
| WELD 300 | Introduction to Welding | 3 |

Other Semesters

| | | |
|---------------|--|-------|
| DESN 102 | Intermediate Computer Aided Drafting and Design (CADD) | 3 |
| ET 143 | Computer Upgrade, Repair, and Assembly | 2 |
| ET 192 | Introduction to Robotics | 2 |
| ET 194 | Intermediate Robotics | 2 |
| ET 195 | Electrical and Mechanical Power and Control Systems ... | 3 |
| MGMT 360 | Management Communication | 3 |
| PHYS 310 | Conceptual Physics | 3 |
| [[ENGR 307 | Industrial Materials Testing (3). | 5 - 8 |
| and MATH 100 | Elementary Algebra (5)] | |
| or [DESN 310 | Graphic Analysis (3) | |
| and DESN 330 | Machine Design (4)] | |
| or [WELD 342 | Symbol Reading, Layout and Fabrication (3) | |
| and ET 196 | Sensors, Measurement, and Control (2)] | |

Associate Degree Requirements: The Mechtronics 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.

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).
- Compare and 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.
- Identify and 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 307 | High Tech Soldering and Fabrication Techniques | 2 |

Advanced Electronics and Telecommunications Certificate

This Advanced Electronics and Telecommunications certificate provides training in electronic system component identification and characteristics; computer component identification, repair, and upgrading; semiconductor theory and application; power supply design and operation; telecommunication copper and fiber optic systems; and advanced troubleshooting. This certificate is designed to be completed in two semesters.

Student Learning Outcomes

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

- Identify and describe the terminology used for working with personal computers.
- Demonstrate safe procedures for working with the internal components of a personal computer.
- Demonstrate and apply electro-static device (ESD) safety procedures for working with computer components.
- Demonstrate the removal and replacement of computer memory modules.
- Apply mathematics and semiconductor theory to identify, evaluate, and correct power supply and filter circuit problems.
- Analyze and apply mathematics, including logarithms and decibels to determine, analyze, and control outputs when problem solving transistor and field effect transistor (FET) circuits.
- Interpret data using various types of test and measurement equipment used in the analysis of power supply and amplifier circuits.
- 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.
- Research and interpret basic electronic components using manufacturers' data manuals, library resources, and the Internet.
- Calculate electronic component values to design.

Career Opportunities

The Advanced Electronics and Telecommunications certificate enables those students who have completed this certificate or are currently working in industry to quickly progress up the career ladder. More skills in the critical areas along with added electronics and telecommunications theory and laboratory practice make this an ideal certificate for those wishing to upgrade and update their electronics skills.

| Requirements for Certificate | | 17 Units |
|------------------------------|--|----------|
| 1st Semester | | |
| ET 115 | Fiber Optics and Telecommunications Cabling..... | 4 |
| ET 302 | Principles of Electricity and Electronics | 4 |
| ET 307 | High Tech Soldering and Fabrication Techniques | 2 |
| Other Semesters | | |
| ET 143 | Computer Upgrade, Repair, and Assembly | 2 |
| ET 322 | Semiconductor Devices and Applications | 5 |

CMOS Mask Design Certificate

The CMOS Mask Design Certificate presents advanced semiconductor theory. Topics include semiconductor physical design rules and integrated circuit concepts. State of the art design software provides hands on experience.

Student Learning Outcomes

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

- implement CMOS technology in the construction and layout of integrated circuits.
- interpret logic diagrams and convert to transistor-level integrated circuit (IC) components.
- apply design rules the layout of specialized circuits using standard cell design rules.
- draw basic semiconductor cells using integrated circuit layout software tools.
- modify specialized circuits using previously designed standard IC cells.
- differentiate schematic symbols.
- explain theory of operation of the seven basic logic gates.
- create schematic diagrams and trace logic signals through a circuit.

Career Opportunities

By earning a CMOS Mask Design Certificate students are qualified for a wide variety of employment opportunities at an entry level position in the semiconductor industry. Experience using state of the art design software allows students hands-on experience using the same programs used by industry. Incorporating semiconductor theory along with semiconductor physical design rules and concepts make this an ideal certificate for those desiring employment in the semiconductor manufacturing industry.

| Requirements for Certificate | | 11 Units |
|------------------------------|--|----------|
| ET 205 | CMOS Mask Design I | 3 |
| ET 206 | CMOS Mask Design II | 3 |
| ET 335 | Integrated Circuits with Computer Applications | 5 |

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.
- Identify and describe the terminology used for working with personal computers.
- Identify and properly name the components inside a personal computer.
- Upgrade and install new and updated software programs.
- Find 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.

- Recognize, measure, and evaluate resistance, capacitance and inductive devices.
- 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 | | 12-15 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 143 | Computer Upgrade, Repair, and Assembly | 2 |
| ET 298 | Work Experience in Electronics Technology | 1 - 4 |
| ET 307 | High Tech Soldering and Fabrication 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.

| Requirements for Certificate | | 17 Units |
|------------------------------|--|----------|
| ET 115 | Fiber Optics and Telecommunication Cabling | 4 |
| ET 302 | Principles of Electricity and Electronics..... | 4 |
| ET 380 | Introduction to Electronic Communications | 4 |
| ET 386 | Fiber Optic Splicing, Connectivity and Testing | 3 |
| ET 387 | Advanced Fiber Optics | 2 |

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 | | 15 Units |
|------------------------------|---|----------|
| ET 192 | Introduction to Robotics | 2 |
| ET 194 | Intermediate Robotics | 2 |
| ET 195 | Electrical and Mechanical Power and Control Systems ... | 3 |
| ET 196 | Sensors, Measurement, and Control | 2 |
| ET 302 | Principles of Electricity and Electronics | 4 |
| ET 307 | High Tech Soldering and Fabrication 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.

| Requirements for Certificate | | 22 Units |
|------------------------------|--|----------|
| 1st Semester | | |
| ET 115 | Fiber Optics and Telecommunication Cabling | 4 |
| ET 302 | Principles of Electricity and Electronics (4) | 4 |
| ET 307 | High Tech Soldering and Fabrication Techniques | 2 |
| Other Semesters | | |
| ET 112 | Communications Units..... | 3 |
| ET 380 | Introduction to Electronic Communications | 4 |
| ET 386 | Fiber Optic Splicing, Connectivity and Testing | 3 |
| ET 387 | Advanced Fiber Optics | 2 |

ET 20 Mobile and Cellular Radio Systems 2 Units

Prerequisite: ET 102.

Hours: 36 hours LEC

Nature of mobile radio signal and its properties. Statistical communication theory introduced and applied in four areas of mobile communications: propagation, received signal characteristics, functional design and system performance. Historic, legal and regulatory aspects of cellular radio industry. Covers specific services and features of the technology, control architectures and switching systems, and siting and economic considerations.

ET 100 Introduction to Telecommunications Systems 3 Units

Hours: 54 hours LEC

This course is an overview of the Telecommunication Industry focusing on both voice and data communication. Terminology, concepts and telecommunication practices are covered along with new and emerging changes in switching systems caused by the next generation of Internet. Additionally, this course focuses on systems that transfer data from one location to another. Field trips are required.

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 102 Advanced Telecommunication Systems 3 Units

Prerequisite: ET 100 with a grade of "C" or better, or Telecommunications Industry Experience.

Hours: 54 hours LEC

This course expands on the concepts mastered in the Introduction to Telecommunication Systems course. Voice/data switching and transmission theory including system operation and design are covered in detail. Emphasis is placed on fiber optics and the newest methods of high speed data transfer. Also included are advanced high speed switching/routing systems along with their associated hardware/software. Dense Wave Division Multiplexing (DWDM) is also covered. Field Trips are required.

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 110 Communications Systems 5 Units

Prerequisite: ET 330 or 335; and ET 380 with a grade of "C" or better.

Hours: 54 hours LEC; 108 hours LAB

This course is a comprehensive study of high frequency communication concepts including antennas, transmission lines, transmitters and receivers. Commercial telecommunication equipment and schematics are used to simulate equipment that is utilized in industry. System design, component and equipment analysis and troubleshooting are stressed. Extensive use of laboratory experiments enhances theory. A field trip is required.

ET 112 Federal Communication Commission License Preparation 3 Units

Advisory: ET 380 or Communication industry experience.

Hours: 54 hours LEC

This course is preparation for the Federal Communication Commission (FCC) General Radiotelephone license examination. The course covers both the electronics theory required and the rules and regulations mandated by the FCC. Field trips are required. This course may be taken four times for credit.

ET 114 Basic Electricity and Electronics for Installation Specialists 5 Units

Advisory: ENGWR 102 or 103, and ENGRD 116; or ESLR 320 and ESLW 320; or placement through assessment process.

Hours: 54 hours LEC; 108 hours LAB

This course is an introduction to the concepts of Direct and Alternating Current Theory. It includes a detailed study of commonly used circuit components, mathematical concepts necessary for calculating circuit values, relationships of components in series, parallel and combination DC and AC circuit configurations and reading electrical diagrams and schematics. Emphasis is on applying electronic concepts to practical situations.

ET 115 Fiber Optics and Telecommunication Cabling 4 Units

Advisory: ET 307.

Hours: 54 hours LEC; 54 hours LAB

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

ET 130 Introduction to High Definition Digital Television 3 Units*Hours: 54 hours LEC*

This course covers the theory and operation of High Definition Digital Television. It covers the concepts and circuitry involved in this medium. Analogies between analog and digital systems are featured enabling an understanding of current technology. Field trips are required.

ET 143 Computer Upgrade, Repair, and Assembly 2 Units*Hours: 18 hours LEC; 54 hours LAB*

This course covers basic personal computer upgrading, repair, and assembly. Safety, terminology, component identification, file management, upgrades, and virus protection are among the topics that are covered. This class may be taken twice for credit.

ET 154 Wireless Communication Systems 1.5 Units*Hours: 18 hours LEC; 27 hours LAB*

This is an introduction to wireless communication designed for electronic technicians. The course includes wireless communication terminology and instruction in the proper use of hardware and test equipment used in installation, maintenance and operation. Topics include the study of individual system component theory and operation as well as the entire wireless communication system.

ET 162 Home Electronics and Power 1 Unit*Hours: 18 hours LEC*

This course is an overview of the power and electronics used in the modern home. It covers the power distributed through the home as well as the appliances and communication systems used. The topics of home security, power conservation, alternate energy sources, and home automation are also covered.

ET 190 Introduction to Programmable Logic Controllers (PLCs) 2 Units*Hours: 36 hours LEC*

This course introduces the fundamentals of the operation and use of the Programmable Logic Controllers (PLC). The PLC uses programmable memory to store instructions and executes specific functions that include on/off control, timing, counting, and sequencing arithmetic used in machine control. Ladder logic is used in programming and troubleshooting the PLC. 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 are required.

ET 194 Intermediate Robotics 2 Units*Hours: 36 hours LEC*

This course covers advanced robotics utilizing the Parallax stamp microcontroller and Boe-Bot robotic vehicle. Topics include the operation and design of robots using the Robix robotic platform. This course includes how robotics and automation are utilized in industry. Hardware component selection, assembly, and software programming of various types of robotic assemblies are emphasized. The principles of electronics, physics, and engineering as they apply to robotic design are presented. Field trips are required.

ET 195 Electrical and Mechanical Power and Control Systems 3 Units*Hours: 54 hours LEC*

This course is a study of electrical and mechanical power components and systems used in the control and transmission of mechanical and electrical power. Topics include the analysis of electric circuits and controls; programmable logic controllers (PLC's), electromagnetic devices and their use in systems; discrete semiconductor switching devices; hydraulic and pneumatic power devices; types and uses of electric motors and generators as well as power distribution systems. Troubleshooting and repair of hydraulic, pneumatic control equipment and electrical / electronic systems are studied through a number of industry-based projects.

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. PLC's and STAMP micro controllers are used to simulate industrial situations.

ET 205 CMOS Mask Design I 3 Units*Prerequisite: ET 302 with a grade of "C" or better**Hours: 48 hours LEC; 18 hours LAB*

This course introduces the foundations of the design and functionality of complementary, metal-oxide, semiconductor (CMOS) integrated-circuit (IC) computer chips. It reviews the history and evolution of computer chips, how they are manufactured, function, and applied. Additional topics include a detailed study on reading, interpreting, and creating logic diagrams, transistor level schematics, cross sectional views, and layouts associated with CMOS IC's as well as the application of design rules, area estimation, pin and bus placements, and efficient circuit layouts. This course prepares students for entry-level mask design and technician positions in the computer industry.

ET 206 CMOS Mask Design II 3 Units*Prerequisite: ET 205 with a grade of "C" or better**Hours: 36 hours LEC; 54 hours LAB*

This course builds on CMOS Mask Design I (ET 205). It applies complex logic and design rules for integrated circuit (IC) layout. It also includes practical experience in the use of an industry-standard integrated circuit design tool, and IC and mask design principles and applications.

ET 250 Employability Skills for Technical Careers 2 Units*Same As: AT 107 and WELD 150**General Education: AA/AS Area III(b)**Hours: 36 hours LEC*

This course provides the opportunity of exploring technical careers while developing valuable work and life skills. It is an introduction to a variety of technically-related occupations. Emphasis is placed on exploring technical careers in the Sacramento area. Activities are designed to enhance personal development, employability skills, and self esteem through leadership, citizenship, and character development.

ET 251 Automotive Electronic Accessories and Installation 3 Units

Same As: AT 251

Corequisite: AT 312 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. Topics related to this course cover the areas for the certification testing required to become a qualified Mobile Electronics Certified Professional (MECP) installer. A field trip is required. This course is not open to students who have taken AT 251.

ET 294 Topics in Electronics Technology .5-5 Units

Prerequisite: To be determined for each topic.

Hours: 9-90 hours LEC; 27-270 hours LAB

This is an individualized course developed in cooperation with industry to meet specialized training needs. It may be taken four times with no duplication of topics.

ET 298 Work Experience in Electronics Technology 1-4 Units

Enrollment Limitation: Be in a paid or non-paid internship, volunteer opportunity or job related to the electronics industry.

Hours: 60-300 hours LAB

This course provides students with opportunities to develop marketable skills in preparation for employment in the electronics field or advancement within their career. It is designed for students interested in work experience and/or internships in associate degree level occupational programs. Course content includes understanding the application of education to the workforce; completion of required forms which document the student's progress and hours spent at the work site; and developing workplace skills and competencies. Rigor is ensured through the development of appropriate level learning objectives set between the student and the employer. During the course of the semester, the student is required to fulfill 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. The weekly orientation is required for first time participants, returning participants are not required to attend the weekly orientation but are required to meet with the instructor as needed to complete all program forms and assignments. ET 298 may be taken for a total of 16 units when there are new or expanded learning objectives. Students can earn a total of 16 Work Experience units.

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. Complete systems such as robotics, Global Positioning Systems (GPS), computers, and home electronics are used to demonstrate component application. The use of electronic simulation software combined with actual hands on lab experiments reinforces theory. Various test equipment such as digital four channel color oscilloscopes, Digital Multi Meters and programmable function generators are used to demonstrate electronic principles and theory of AC, DC, Ohm's law, inductance and capacitance as they apply to voltage and frequency response. Field trips to local electronics industries are required.

ET 303 Energy and Sustainability 3 Units

Same As: ENERGY 303 and NATR 303

General Education: AA/AS Area IV (effective Summer 2009)

Course Transferable to CSU

Hours: 54 hours LEC

Fundamentals of energy and its impact on society and the environment are covered in this course. The mechanics, advantages and disadvantages of current and future renewable, green and nonrenewable energy sources are investigated. Residential energy audits are covered. Field trips are required. This course is not open to students who have completed ENERGY 303 or NATR 303.

ET 307 High Tech Soldering and Fabrication Techniques 2 Units

Advisory: ET 302.

Course Transferable to CSU

Hours: 18 hours LEC; 54 hours LAB

This course teaches fundamental soldering techniques required in the Electronics industry. Lecture and lab exercises introduce state of the art processes involving safety, component and tool identification, diagrams, terms, standards, soldering [plated through hole (PTH), surface mount (SMT), fine and ultra fine pitch], de-soldering, electrostatic discharge (ESD), devices and assembly. Field trips are required. This course may be taken twice for credit.

ET 310 Mathematics for DC Circuit Fundamentals, Part I 1.5 Units

General Education: AA/AS Area II(b)

Course Transferable to CSU

Hours: 27 hours LEC

This course covers mathematics for direct current (DC) circuit fundamentals. Powers of ten, algebra and other mathematical concepts necessary for calculation of resistance, DC voltage and current distribution in series, parallel, and combination circuits are covered.

ET 311 Mathematics for AC Circuit Fundamentals, Part II 1.5 Units

Prerequisite: ET 310 with a grade of "C" or better

General Education: AA/AS Area II(b)

Course Transferable to CSU

Hours: 27 hours LEC

The foundations of mathematics used in the analysis of alternating current (AC) circuits are covered in this course. Topics include algebra and trigonometry for the mathematical analysis of AC circuits involving resistance, capacitance, inductance and/or reactances in series, parallel and combination circuits.

ET 322 Semiconductors and Nanotechnology 5 Units

Prerequisite: ET 302 with a grade of "C" or better.

Advisory: ET 310 and 311.

Course Transferable to CSU

Hours: 54 hours LEC; 108 hours LAB

This course is a detailed study of semiconductor and nanotechnology devices and their applications. Semiconductor manufacturing and components such as diodes, transistors, op-amps, and field programmable analog arrays (FPAA), including their use in complex circuits are covered. Nanotechnology theory and devices including their present and possible future applications are studied. Field trips are required.

ET 335 Integrated Circuits with Computer Applications 5 Units

Prerequisite: ET 302 with a grade of "C" or better.

Course Transferable to CSU

Hours: 54 hours LEC; 108 hours LAB

This course covers integrated circuits (IC's) and applications used in industrial and consumer products. Digital theory and applications start with standard transistor-transistor logic (TTL) and complementary metal oxide semiconductor (CMOS) logic circuits and progress into complex circuits built on programmable logic devices (PLDs) using very-large-scale-integration hardware description language (VHDL). Field trips are required.

ET 337 Advanced Integrated Circuit Applications 3 Units

Prerequisite: ET 330 or ET 335 with a grade of "C" or better.

Course Transferable to CSU

Hours: 36 hours LEC; 54 hours LAB

This course is a continuation of Integrated Circuit Applications, ET 335. It includes a comprehensive study of advanced circuits used in various industrial and consumer applications. Topics include advanced operational amplifier circuits; electrical-mechanical transducers; voice recognition and reproduction circuits; motor driver circuits; global positioning circuits (GPS); and computer and human interface circuits. Field trips are 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 for students to design and build advanced projects. It enables students to work on approved electronics projects outside the scope of typical classroom applications. Students learn the process of planning, design, prototyping, and fabrication while building an actual working project. Completed projects are entered in county and statewide technology 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. This course may be taken three times on different projects.

ET 380 Introduction to Electronic Communications 4 Units

Prerequisite: ET 301 or ET 302 with a grade of "C" or better.

Course Transferable to CSU

Hours: 54 hours LEC; 54 hours LAB

This course covers 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 are 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 are required. This course may be taken two times on different certification requirements.

ET 386 Fiber Optic Splicing, Connectivity and Testing 3 Units

Course Transferable to CSU

Hours: 54 hours LEC

This is an introductory course in fiber optic theory and operation including the complete fiber optic communication system. It includes

fiber optic terminology and instruction in the proper 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 Reflectometer (OTDR). A field trip is required. This course may be taken twice for credit using different equipment.

ET 387 Advanced Fiber Optics 2 Units

Prerequisite: ET 386 with a grade of "C" or better.

Course Transferable to CSU

Hours: 36 hours LEC

This course covers advanced fiber optic theory and operation. Fiber optic systems are vital communication links that enable high speed transfer of video, telephone, and data to occur. Testing of fiber optic systems using sophisticated electro-optical test equipment such as the Optical Time Domain Reflectometer (OTDR) is included. This course also introduces the use of computer based software to simplify fiber optic system design. May be taken twice for credit.

ET 420 Microcontrollers and Digital Signal Processors 5 Units

Prerequisite: ET 302 with a grade of "C" or better.

Course Transferable to CSU

Hours: 54 hours LEC; 108 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, programming, memory, data converters and the interfacing of input/output devices, sensors and motors. Field trips are required.

ET 421 Advanced Microprocessors, Microcontrollers, and Programmable Logic Devices 3 Units

Prerequisite: ET 420 with a grade of "C" or better.

Course Transferable to CSU

Hours: 36 hours LEC; 54 hours LAB

This course is a continuation of ET 420. It focuses on the advanced features of microprocessors, microcontrollers, and Programmable Logic Devices (PLD). Topics include microcontroller assembly language; optical, RF and serial communication techniques; output display design; and developing Reduced Instruction Set Controller (RISC) microprocessors from PLD's. Field trips are required.

ET 425 Introduction to Biomedical Equipment Technology 4 Units

Prerequisite: ET 322, 335, or 380 with a grade of "C" or better

Course Transferable to CSU

Hours: 72 hours LEC

This course covers the foundation of biomedical equipment and the responsibilities of electronic technicians interested in working in the medical device service industry for hospitals, medical device manufacturers, or other service organizations. It includes a detailed study of the 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 490 Advanced Student Projects Laboratory 2 Units

Prerequisite: ET 322, 335, or 380 with a grade of "C" or better

Course Transferable to CSU

Hours: 108 hours LAB

This course provides opportunities to pursue advanced projects selected by the Electronics department. It may be taken two times for credit on different projects.