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 Telecommunication 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 micro-controllers.

**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.

<table>
<thead>
<tr>
<th>Requirements for Degree</th>
<th>37 Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET 112</td>
<td>Communications Units .................. 3</td>
</tr>
<tr>
<td>ET 115</td>
<td>Fiber Optics and Telecommunication Cabling .......... 4</td>
</tr>
<tr>
<td>ET 143</td>
<td>Computer Upgrade, Repair, and Assembly ........... 2</td>
</tr>
<tr>
<td>ET 302</td>
<td>Principles of Electricity and Electronics .......... 4</td>
</tr>
<tr>
<td>ET 307</td>
<td>High Tech Soldering and Fabrication Techniques .... 2</td>
</tr>
<tr>
<td>ET 310</td>
<td>Mathematics for DC Circuit Fundamentals, Part I ......... 1.5</td>
</tr>
<tr>
<td>ET 311</td>
<td>Mathematics for AC Circuit Fundamentals, Part II .... 1.5</td>
</tr>
<tr>
<td>ET 322</td>
<td>Semiconductor Devices and Applications .......... 5</td>
</tr>
<tr>
<td>ET 335</td>
<td>Integrated Circuits with Computer Applications .......... 5</td>
</tr>
<tr>
<td>ET 380</td>
<td>Introduction to Electronic Communications .......... 4</td>
</tr>
<tr>
<td>ET 420</td>
<td>Microcontrollers and Digital Signal Processors .......... 5</td>
</tr>
</tbody>
</table>

**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 in this program.

**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.

<table>
<thead>
<tr>
<th>Requirements for Degree or Certificate</th>
<th>36 Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Semester</td>
<td></td>
</tr>
<tr>
<td>ET 302</td>
<td>Principles of Electricity and Electronics .......... 4</td>
</tr>
<tr>
<td>DESGN 100</td>
<td>Introduction to Computer Aided Drafting and Design (CADD) .......... 4</td>
</tr>
<tr>
<td>WELD 300</td>
<td>Introduction to Welding .......... 3</td>
</tr>
<tr>
<td>Other Semesters</td>
<td></td>
</tr>
<tr>
<td>DESGN 102</td>
<td>Intermediate Computer Aided Drafting and Design (CADD) .......... 3</td>
</tr>
<tr>
<td>ENGR 307</td>
<td>Industrial Materials Testing .......... 3</td>
</tr>
<tr>
<td>ET 143</td>
<td>Computer Upgrade, Repair, and Assembly .......... 2</td>
</tr>
<tr>
<td>ET 192</td>
<td>Introduction to Robotics .......... 2</td>
</tr>
<tr>
<td>ET 194</td>
<td>Intermediate Robotics .......... 2</td>
</tr>
</tbody>
</table>
American River College Catalog 2008-2009

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.

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET 115</td>
<td>4</td>
</tr>
<tr>
<td>ET 302</td>
<td>4</td>
</tr>
<tr>
<td>ET 307</td>
<td>2</td>
</tr>
</tbody>
</table>

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.

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

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>ET 115  Fiber Optics and Telecommunications Cabling</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>ET 302  Principles of Electricity and Electronics</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>ET 307  High Tech Soldering and Fabrication Techniques</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>ET 143  Computer Upgrade, Repair, and Assembly</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>ET 322  Semiconductor Devices and Applications</td>
<td>5</td>
</tr>
</tbody>
</table>

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.

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 makes this an ideal certificate for those desiring employment in the semiconductor manufacturing industry.

Requirements for Certificate 12 Units

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 320 Operating Systems</td>
<td>1</td>
</tr>
<tr>
<td>ET 205 CMOS Mask Design I</td>
<td>3</td>
</tr>
<tr>
<td>ET 206 CMOS Mask Design II</td>
<td>3</td>
</tr>
<tr>
<td>ET 335 Integrated Circuits with Computer Applications</td>
<td>5</td>
</tr>
</tbody>
</table>

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.

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 320 Operating Systems</td>
<td>1</td>
</tr>
<tr>
<td>CISC 361 Microcomputer Support Essentials - Preparation for A+ Certification</td>
<td>3</td>
</tr>
<tr>
<td>CISC 363 Microcomputer Support Technical - Preparation for A+ Certification</td>
<td>3</td>
</tr>
<tr>
<td>ET 143 Computer Upgrade, Repair, and Assembly</td>
<td>2</td>
</tr>
<tr>
<td>ET 298 Work Experience in Electronics Technology</td>
<td>1 - 4</td>
</tr>
<tr>
<td>ET 307 High Tech Soldering and Fabrication Techniques</td>
<td>2</td>
</tr>
</tbody>
</table>

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.

Career Opportunities

The Fiber Optic certificate prepares the student to obtain entry level employment in a wide variety of positions in the telecommunications 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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET 115</td>
<td>Fiber Optics and Telecommunication Cabling</td>
<td>4</td>
</tr>
<tr>
<td>ET 302</td>
<td>Principles of Electricity and Electronics</td>
<td>4</td>
</tr>
<tr>
<td>ET 380</td>
<td>Introduction to Electronic Communications</td>
<td>4</td>
</tr>
<tr>
<td>ET 386</td>
<td>Fiber Optic Splicing, Connectivity and Testing</td>
<td>3</td>
</tr>
<tr>
<td>ET 387</td>
<td>Advanced Fiber Optics</td>
<td>2</td>
</tr>
</tbody>
</table>

### 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.

### Requirements for Certificate 15 Units

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET 192</td>
<td>Introduction to Robotics</td>
<td>2</td>
</tr>
<tr>
<td>ET 194</td>
<td>Intermediate Robotics</td>
<td>2</td>
</tr>
<tr>
<td>ET 195</td>
<td>Electrical and Mechanical Power and Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>ET 196</td>
<td>Sensors, Measurement, and Control</td>
<td>2</td>
</tr>
<tr>
<td>ET 302</td>
<td>Principles of Electricity and Electronics</td>
<td>4</td>
</tr>
<tr>
<td>ET 307</td>
<td>High Tech Soldering and Fabrication Techniques</td>
<td>2</td>
</tr>
</tbody>
</table>

### Telecommunication Specialist Certificate

The Telecommunication Specialist certificate provides an overview of electronics and 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**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET 115</td>
<td>Fiber Optics and Telecommunication Cabling</td>
<td>4</td>
</tr>
<tr>
<td>ET 302</td>
<td>Principles of Electricity and Electronics</td>
<td>4</td>
</tr>
<tr>
<td>ET 307</td>
<td>High Tech Soldering and Fabrication Techniques</td>
<td>2</td>
</tr>
</tbody>
</table>

**Other Semesters**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET 112</td>
<td>Communications Units</td>
<td>3</td>
</tr>
<tr>
<td>ET 380</td>
<td>Introduction to Electronic Communications</td>
<td>4</td>
</tr>
<tr>
<td>ET 386</td>
<td>Fiber Optic Splicing, Connectivity and Testing</td>
<td>3</td>
</tr>
<tr>
<td>ET 387</td>
<td>Advanced Fiber Optics</td>
<td>2</td>
</tr>
</tbody>
</table>

### 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.

### 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.

### Introduction to Telecommunications Systems 3 Units

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

### 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.

### 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.

### 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
Corequisite: ET 330.
Hours: 36 hours LEC
This course is an introduction to the operation and use of the Programmable Logic Controller (PLC), an electronic device that controls machines and processes. The PLC uses a programmable memory to store instructions and executes specific functions that include on/off control, timing, counting sequencing arithmetic, and data handling. Ladder logic is used in programming and troubleshooting the PLC. May be taken twice for credit.

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 (PLCs); 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. PLCs and STAMP micro controllers are used to simulate industrial situations.

ET 205 CMOS Mask Design I 3 Units
Corequisite: ET 330.
Hours: 54 hours LEC
This course is an entry level integrated circuit (IC) layout and design in CMOS (Complementary Metal-Oxide-Silicon) technology. This course provides practical experience in drawing logic diagrams, transistor level schematics, cross sectional views, STIK diagrams, and in converting STIKS to the actual layout of the layers that will be used to manufacture the IC. The course stresses application of design rules, area estimation, and pin and bus placements.

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
CMOS Mask Design II is a continuation of CMOS Mask Design I (ET 205). This course introduces more complex logic and design rules for integrated circuit layout. This course also includes practical experience in the use of a Unix-based integrated circuit design tool, Cadence VLE, from Cadence Design Systems.

ET 250 Employability Skills for Technical Careers 2 Units
Same As: AT 107 and WELD 150
General Education: AA/AS Area II(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.
### Electronics Technology

#### ET 251 Automotive Electronic Accessories and Installation  
**3 Units**

*Same As: AT 251*
*Corequisite: AT 312 or ET 302*
*Hours: 270 hours LEC, 54 hours LAB*

This course covers the principles and processes involved in the installation of mobile entertainment, security, positioning and other electronic and electrical related systems and components. Safety, circuit diagrams, inspection, wiring, installation and troubleshoot- ing 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: 90 hours LEC, 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: 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 Transferrable 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 307 High Tech Soldering and Fabrication Techniques  
**2 Units**

*Advisory: ET 302*
*Course Transferrable 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 Transferrable to CSU*
*Hours: 27 hours LEC*

This course covers mathematics for direct current (DC) circuit funda- mentals. 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 Transferrable 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 Transferrable to CSU*
*Hours: 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 Transferrable to CSU*
*Hours: 108 hours LAB*

This course covers integrated circuits (ICs) and applications used in industrial and consumer products. Digital theory and applications start with standard transistor-transistor logic (TTL) and complement- ary 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 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 electra-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 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.