ELECTRONICS TECHNOLOGY

Associate of Applied Science Degree

- General Electronics Technology Concentration
- Biomedical Electronics Concentration

Certificates of Completion

- Electronics Technology
- Biomedical Electronics

The explosion in the number and diversity of electronic devices used in home and industry settings has greatly intensified the demand for qualified technicians. As orders for high-tech communications equipment and electronic products continue to rise, job opportunities for electronics technicians will expand even more. Salaries in the various branches of electronics are among the highest for all technology areas.

Students in the Electronics Technology program learn using state-of-the-art equipment and instrumentation. They work and train in spacious, modern laboratories similar to those used in industry. Students have the opportunity to analyze and troubleshoot actual problems while learning from knowledgeable and experienced instructors.

The Electronics Technology program may be completed on a part-time basis by taking classes during the evening or during the day. Those who wish to pursue a bachelor of science degree in Engineering Technology at New Mexico State University may apply up to 36 credit hours from the Electronics Technology program toward the four-year degree.

While pursuing this program, whether they are taking classes or working as apprentices, students will be required to perform the same job duties and be able to meet the same physical requirements that they will as a graduate in the field. Depending where they find employment, graduates may be required to lift up to 50 pounds from the ground, work safely around electrical equipment using the appropriate safety equipment, work safely using hand and power tools, ascend and descend stairs and ladders, and stand, squat, stoop or kneel for long periods of time.

Two program options are available:

General Electronics Concentration

The General Electronics Concentration prepares graduates for entry-level employment as technical assistants and technicians in the fabrication, testing, maintenance, and repair of electrical and electronic equipment. Job opportunities exist in the areas of manufacturing and repair of electronic instruments, audio and video electronics, computers, medical equipment, and industrial and consumer electronic equipment. While positions for electronics technicians are found in all sectors of the economy, many of the jobs in southern New Mexico are in government and defense-related industries. Opportunities for advancement in the electronics field are above average.

Biomedical Electronics Concentration

The Biomedical Electronics Concentration is a specialized program focusing on medical equipment. Career opportunities exist in hospital and clinical settings, engineering departments, and medical equipment manufacturing companies, as well as other organizations serving the rapidly expanding medical equipment service market. This course of study will also help prepare the electronics student for the Biomedical Equipment Technician Certification Exam of the International Certification Commission for Clinical Engineering and Biomedical Technology.

Electronics Technology (Biomedical Electronics) - Associate of Applied Science (https://catalogs.nmsu.edu/dona-ana/academic-career-programs/electronics-technology/electronics-technology-biomedical-electronics-associate-applied-science/)

Electronics Technology (General Electronics) - Associate of Applied Science (https://catalogs.nmsu.edu/dona-ana/academic-career-programs/electronics-technology/electronics-technology-general-electronics-associate-applied-science/)

Electronics Technology - Certificate of Completion (https://catalogs.nmsu.edu/dona-ana/academic-career-programs/electronics-technology/general-electronics-technology-certificate-ompletion/)

Biomedical Electronics - Certificate of Completion (https://catalogs.nmsu.edu/dona-ana/academic-career-programs/electronics-technology/biomedical-electronics-certificate-completion/)

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ELT 103. Math Study Skills for Electronics
1 Credit (1)
Covers specific math study skills and critical thinking processes to reinforce practical applications of math and its use with electronics. The student will be introduced to electronic mathematical formulas during the problem-solving steps required for circuit analysis. May be repeated up to 4 credits.
Prerequisite(s)/Corequisite(s): E T 183 OR E T 184. Restricted to Community Colleges only.

ELT 105. Basic Electricity and Electronics
3 Credits (2+2P)
Fundamentals of electricity and electronics, basic circuit devices, meters, transistors, integrated circuits and other solid state devices, computers, fiber optics, and industrial application topics. Minimum math proficiency of CCDM 103 or CCDM 104 required or math placement into CCDM 114 or higher. Restricted to: Community Colleges only. Crosslisted with: AERT 111 May be repeated up to 3 credits.
Learning Outcomes

1. Recall and state Ohm's Law and its components (current, resistance, voltage).
2. Demonstrate an understanding of the distinctions between formulas, equations, and expressions, and identify appropriate usage for each in different situations.
3. Apply knowledge and skills to solve problems in series and parallel electronic circuits.
4. Analyze graphs related to electronic circuits and evaluate values derived from those graphs.
5. Evaluate basic principles, formulas, the superposition theorem, and the Thevenin theorem to solve simple problems in electronics and general engineering.
6. Synthesize knowledge and skills to design and develop solutions for complex problems in electronics and engineering, incorporating the principles and theorems learned.

ELT 110. Electronics I
4 Credits (3+3P)
Fundamentals of electronics including: components, schematics, Ohm's law, Thevenin's and Norton's theorems, and series/parallel circuits incorporating passive, active and magnetic elements. Introduction to AC

circuits. Crosslisted with: AERT123. Restricted to: Community Colleges only.

Learning Outcomes

1. Describe Ohm's Law and its components (current, resistance, voltage).
2. Cite the differences between formulas, equations, and expressions, and determine appropriate usage for each in various situations.
3. Apply acquired knowledge and skills to solve problems involving series and parallel electronic circuits.
4. Evaluate fundamental principles, formulas, the superposition theorem, and the Thevenin theorem to solve straightforward problems in electronics and general engineering.
5. Analyze graphs pertaining to electronic circuits and interpret values obtained from those graphs.
6. Integrate knowledge and skills to design and develop solutions for intricate problems in electronics and engineering, incorporating learned principles and theorems.
7. Apply acquired knowledge and skills to solve problems involving series and parallel electronic circuits.

ELT 120. Mathematics for Electronics
4 Credits (4)

Includes fundamental mathematics, algebra, sine, cosine, and other elementary functions as they specifically apply to the operation, manipulation, and evaluation of direct current (DC) and alternating current (AC) circuits. Minimum math proficiency of CCDM 114 required or math placement into MATH 1215 or higher. Restricted to: Community Colleges only. Crosslisted with: AERT 124

Learning Outcomes

1. Calculate and find solutions for linear and quadratic equations.
2. Evaluate logarithmic and exponential functions to solve problems in electronics and general engineering.
3. Analyze given trigonometric problems and determine which trigonometric function is appropriate to solve them.
4. Demonstrate an understanding of the distinctions between formulas, equations, and expressions, and will work through examples of each type to determine their appropriate usage in different situations.
5. Solve problems pertaining to both series and parallel electronic circuits.

ELT 135. Electronics II
4 Credits (3+3P)

Analysis of AC circuits, filters, and resonance. Introduction to solid state fundamentals including diodes and rectifier circuits, voltage regulators, various transistors and transistor characteristics, amplification and amplifiers, photoelectric effects, gates and timing circuits. Restricted to Community College Campuses Only. May be repeated up to 4 credits.

Prerequisite: A grade of C- or better in ELT 110 and ELT 120.

Learning Outcomes

1. Identify and solve alternating current and voltage circuits and do analysis of AC circuits.
2. Demonstrate by drawing series and parallel RC circuits, measure power in RC circuits, and trouble shoot for applications.
3. Recognize types of inductors, inductors in series and parallel, inductors in DC and AC circuits and select correct inductors for their applications.
4. Measure voltages, currents in series and parallel RL circuits, power in RL circuits, and find troubleshooting faults for basic applications.
5. Test RLC circuits for series and parallel designs and solve RLC resonance circuits and filters and their applications.
6. Identify self and mutual inductance; recognize types of transformers and their characteristics, test loading a transformer, do impedance matching in transformer applications and troubleshooting.
7. Apply, identify and solve time response of RC and RL integrators and differentiators for wave pulses, troubleshooting and applications.

ELT 155. Electronics CAD and PCB Design
3 Credits (2+2P)

Introduction to and the use of commercially available CAD software covering schematic representation of electronic components and circuits. Printed circuit board layout techniques including proper schematic capture, netlist generation, design rule checking and manual routing covered.

Learning Outcomes

1. Design and develop a schematic using the specified software.
2. Generate a schematic symbol for a component.
3. Develop a PCB footprint for a component.
4. Produce a board outline based on given design guidelines.
5. Create a netlist from a schematic.

ELT 160. Digital Electronics I
4 Credits (3+3P)

Number systems, codes, Boolean algebra, logic gates, Karnaugh maps, combination circuits, flip-flops, and digital troubleshooting techniques. Restricted to Community College Campuses Only. May be repeated up to 4 credits.

Prerequisite: A grade of C- or better in ELT 110 and (ELT 120 or MATH 1215).

Learning Outcomes

1. Explan why the binary, binary-coded decimal (BCD), and hexadecimal number systems are used in electronics.
2. Convert between the decimal, binary, binary-coded decimal (BCD), and hexadecimal number systems.
3. Identify each of the six basic logic gating symbols, their truth tables, and their logic expressions.
4. Constuct a truth table and logic expression for each of the six basic gating symbols.
5. Draw a parallel adder circuit and solve for the binary outputs when given binary input values.
6. Formulate using Boolean algebra, Demorgan's theorem or Karnaugh Mapping to minimize a digital logic circuit.
7. Design, Construct and test simple logic gate circuits.
8. Construct and test a simple R-S (Latch) and "D" type flip-flop.

ELT 175. Soldering Practices
3 Credits (2+2P)

Methods and techniques of hand soldering in the production of high quality and reliable soldering connections. Restricted to: Community Colleges only. May be repeated up to 3 credits.

Learning Outcomes

1. Demonstrate the correct techniques for tinning and maintaining a soldering iron.
2. Compare and contrast the advantages and disadvantages of different proper soldering techniques.
3. Define the different types of mechanical strippers and how they should be used.

4. Install a wire into a turret terminal, a cup terminal, and a pierced tab terminal in accordance with established criteria.
5. Express three types of terminations used for surface mount components.
6. Describe the types of terminations normally used for making repairs.

ELT 205. Semiconductor Devices
4 Credits (3+3P)
Analysis and trouble shooting of linear electronic circuits including amplifiers, op-amps, power supplies, and oscillators. Restricted to Community College Campuses Only. May be repeated up to 4 credits.
Prerequisite: A grade of C- or better in ELT 110 and ELT 135.
Learning Outcomes
1. Explain the conditions which exist at the PN junction of an unbiased diode, a forward-biased diode, and reverse biased diode.
2. Diagram a half-wave, full-wave, and bridge rectifier circuits and explain how they function.
3. Define the characteristics of amplifiers, including classes of operation and efficiencies.
4. Describe several JFET and MOSFET applications.
5. Explain the difference between passive and active filters.
6. Practice a positive attitude and the soft skills necessary for successful employment in the electronics industry.

ELT 215. Microprocessor Applications I
4 Credits (3+2P)
Fundamentals of microprocessor architecture and assembly language with an emphasis on hardware interfacing applications.
Prerequisite(s)/Corequisite(s): ELT 235. Prerequisite(s): ELT 160. Restricted to: Community Colleges only.

ELT 220. Electronic Communication Systems
4 Credits (3+2P)
Principles and applications of circuits and devices used in the transmission, reception, and processing of RF, microwave, digital and telecommunications systems. Restricted to Community College Campuses Only. May be repeated up to 4 credits.
Prerequisite: A grade of C- or better in ELT 135.
Prerequisite/Corequisite: ELT 205.
Learning Outcomes
1. Analyze the relationship between current, resistance, and voltage to compute values for filters and filter gains.
2. Demonstrate an understanding of the distinctions between formulas, equations, and expressions, and their respective applications in different situations.
3. Employ the necessary skills to solve problems modulation/demolition processes and circuits.
4. Evaluate the effectiveness and efficiency of communication circuits.
5. Apply fundamental principles and formulas to solve straightforward problems in communication.

ELT 221. Cooperative Experience I
1-6 Credits
Supervised cooperative work program. Student is employed in an approved occupation and supervised and rated by the employer and instructor. Student will meet in a weekly class. Graded S/U.
Prerequisite: consent of instructor.

ELT 222. Cooperative Experience II
1-6 Credits
Continuation of ELT 221. Maximum of 6 credits. Graded S/U.
Prerequisite: consent of instructor.

ELT 225. Computer Applications for Technicians
3 Credits (2+2P)
An overview of computer hardware, software applications, operating systems, high level programming languages and networking systems. May be repeated up to 3 credits.
Learning Outcomes
1. Evaluate network security measures, identify potential vulnerabilities, and reflect on the importance of implementing appropriate security protocols to protect network systems from unauthorized access and potential threats.
2. Design and configure network infrastructures that meet specific requirements and performance criteria.
3. Identify and interpret network management and administration principles, troubleshoot network issues, and provide appropriate support to ensure the smooth operation of computer networks.
4. Evaluate and compare different network protocols, IP addressing schemes, and network reference models and standards, and synthesize this information to design efficient and secure network systems.
5. Apply their knowledge of computer hardware, software applications, operating systems, high-level programming languages, and networking systems to solve practical problems and analyze different network topologies and technologies.
6. Define and explain the fundamental concepts of computer hardware, software applications, operating systems, high-level programming languages,and networking systems.

ELT 230. Microprocessor Applications II
4 Credits (3+2P)
Advanced microprocessor interfacing techniques. Topics in A/D and D/A conversion, I/O port address decoding, direct memory accessing, and peripheral device interfacing applications.
Prerequisite: ELT 215.

ELT 235. Digital Electronics II
3 Credits (2+2P)
Sequential logic circuits, latches, counters, shift-registers, fault analysis and troubleshooting of digital IC s, multiplexers, timers, encoders/decoders, arithmetic circuits, pulse shaping, and memory devices. Restricted to: Community Colleges only. May be repeated up to 3 credits.
Prerequisite: A grade of C- for better in ELT 160.
Learning Outcomes
1. Describe the operations of different types of Flip-Flops and data registers, and explain the practical timing limitations of sequential logic circuits.
2. Produce timing measurements and apply practical circuits to solve switch debouncing and noise issues.
3. Analyze timing waveforms using test equipment and draw digital timing diagrams. They will also understand how multivibrators and oscillators function as timing sources, and be able to interface common devices to digital systems for control and data acquisition.
4. Describe the major types of memory devices and storage media, and recognize the fundamental use of microprocessors and microcontrollers.
5. Illustrate how multivibrators and oscillators function as timing sources, and interface common devices to digital systems for control and data acquisition.
6. Develop positive work habits necessary for success in the workplace.

ELT 240. Introduction to Photonics
4 Credits (3+2P)
Nature of light, light emitters, lasers, detectors, fiber optics communications systems, and other applications of light to electronics. May be repeated up to 4 credits.
Prerequisite: A C- or better in ELT 135 or consent of instructor.
Learning Outcomes

1. Analyze different scenarios and effectively apply appropriate techniques and methodologies to address challenges in fiber optic communication.
2. Express the differences between light detectors used in fiber optic communication compared to detectors used in electronics communication.
3. Interpret and solve problems related to signal attenuation, gain, and noise using logarithmic and exponential functions.
4. Evaluate and compare various types of detectors used in fiber optic communication systems.
5. Classify the characteristics and advantages of different detectors and make informed decisions on selecting the best detectors for specific applications.

ELT 245. Radar: Principles and Applications
3 Credits (3)
Explores the principles of operation for microwave radar applications and supporting subsystems.
Prerequisite: E T 246.
Learning Outcomes

1. Students will analyze the various factors that comprise the Radar Equation and apply the equation in calculations for various scenarios.
2. Students will explain the principles of Moving Target Indication, Pulse Doppler, Phased Array, and Synthetic Aperture Radars, and their advantages and disadvantages.
3. Students will analyze and calculate the effects of clutter and environmental noise, earth surface scattering, and atmospheric attenuation, diffraction, and refraction on radar propagation.
4. Students will analyze the performance of supporting radar subsystems, including transmitters, receivers, antennas, tracking servos, and signal processing.
5. Students will explain the kinds of information that can be obtained from radar signals and perform calculations associated with range determination, target motion resolution, and error.
6. Students will explain the use of telemetry, and correlate test radar and telemetry measurements.
7. Students will explain and compare radar countermeasures and analyze their effect on radar return cross-sections.

ELT 250. Electronics Systems Analysis
2 Credits (1+3P)
Capstone course emphasizing a systems approach to troubleshooting and maintaining complex electronics systems. Includes program review in preparation for technician certification. May be repeated up to 2 credits.
Learning Outcomes

1. Develop an understanding of the fundamental concepts and principles related to measurement, conversions, and control temperature as it relates to strain, pressure, motion, and power.
2. Interpret and analyze electrical instrumentation circuits and systems, as well as the principles and methodologies involved in process control.
3. Analyze the characteristics and advantages of different control systems and synthesize their understanding to select the most suitable control system for a given application.
4. Correlate different scenarios and select appropriate measurement and control techniques to address engineering challenges.

ELT 260. Instrumentation Control and Signal Conditioning
4 Credits (3+2P)
Introduction to sensors and transducers, signal conditioning and transmission for measuring and process control systems. Includes AD, DA converter, small servos and actuators. Prerequisite:ELT 205.

ELT 265. Special Topics
1-6 Credits
Topic to be announced in the Schedule of Classes.

ELT 270. Biomedical Equipment Instrumentation
4 Credits (3+2P)
Principles and applications of electronic circuits and devices used in biomedical equipment. Skills taught to include evaluating, troubleshooting and repairing various types of medical equipment.
Prerequisite(s)/Corequisite(s): ELT 260. Prerequisite(s): ELT 205.
Restricted to: Community Colleges only.

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