

**PROGRAM CONCENTRATION: Architecture, Construction,  
Communications & Transportation**  
**CAREER PATHWAY: Transportation Logistical Operations**  
**COURSE TITLE: Electrical/ Electronic Systems and Design**

Electrical/ Electronic Systems and Design in Logistics is the second course in the Transportation Logistical Pathways. The course will help students build a strong scientific knowledge base and develop skills related to electrical and electronics in the logistics and transportation sector. Mastery of these standards through project-based learning and leadership development activities of the Career and Technical Student Organizations will help prepare students with a competitive edge for the transportation logistics marketplace.

Note: For a more comprehensive and authoritative report of national academic related skills please refer to the National Automotive Technicians Education Foundation's document "APPLIED ACADEMIC & WORKPLACE SKILLS FOR AUTOMOBILE TECHNICIANS" available at [www.natef.org](http://www.natef.org)

**ACT-ESD-1 Demonstrate knowledge of general electrical concepts, diagnosis, and repair.**

***Academic Standards:***

*ELA10W3 The student uses research and technology to support writing.*

*SPS5. Students will compare and contrast the phases of matter as they relate to atomic and molecular motion.*

***National Academic Standards (NATEF):***

*LA283 The technician uses computerized and other databases to obtain system information.*

*MA001 The technician can use Ohm's Law to determine circuit parameters that are out of tolerance.*

*SC177 The technician can demonstrate an understanding of and explain the properties of electricity that impact the lighting, engine management, and other electrical systems in the vehicle.*

**ACT-ESD-2 Demonstrate knowledge of battery concepts, diagnosis, and repair.**

***Academic Standard:***

*SPS6. Students will investigate the properties of solutions.*

***National Academic Standards (NATEF):***

*LA 278 The technician uses text resources such as glossaries of terms, service manual indexes, database menus, and tables of contents to gather data for diagnosis and repair.*

*MA174 The technician can interpret charts, tables, or graphs to determine the manufacturer's specifications for a given system.*

*SC 211 The technician can demonstrate an understanding of the ion transfer process that occurs in an automotive battery.*

### **ACT-ESD-3 Demonstrate knowledge of starting system concepts, diagnosis, and repair.**

***Academic Standard:***

*SPS10. Students will investigate the properties of electricity and magnetism.*

***National Academic Standards (NATEF):***

*LA038 The technician collects and organizes oral and written information based on discussions, notes, observations, personal experiences, and data collection that will assist in the problem analysis and solution process.*

*MA226 The technician can use conventional symbols (E for voltage, etc.) to solve problems using formulas such as Ohm's Law,  $E=IR$ .*

*SC217 The technician can explain the effect of magnetic fields on unshielded circuits in control modules.*

### **ACT-ESD-4 Demonstrate knowledge of charging system concepts, diagnosis, and repair.**

***Academic Standards:***

*SPS9. Students will investigate the properties of waves.*

*ELA11W3 The student uses research and technology to support writing.*

***National Academic Standards (NATEF):***

*LA020 The technician uses study habits and methods when consulting the manufacturer's publications, e.g., shop manuals, references, and computer databases.*

*MA187 The technician can use formulas to indirectly measure systems that are outside of the manufacturer's specifications.*

*SC214 The technician can explain the relationship between electrical current in a conductor and magnetic field when produced in a coil such as the starter solenoid.*

### **ACT-ESD-5 Demonstrate knowledge of lighting systems concepts, diagnosis, and repair.**

***Academic Standards:***

*ELA11W3 The student uses research and technology to support writing.*

*SPS10. Students will investigate the properties of electricity and magnetism.*

***National Academic Standards (NATEF):***

*LA035 The technician attends to all written and oral directions that relate to the task or system under study.*

*MA228 The technician can analyze and solve problems requiring the use of fractions, decimals, ratios, or percentages by a direct or indirect variation of the numerical elements of the problem.*

*SC333 The technician can demonstrate an understanding of refraction as it occurs in systems that employ fiber optics.*

**ACT-ESD-6 Demonstrate knowledge of gauges, warning devices, and driver information.**

***Academic Standards:***

*ELA11W3 The student uses research and technology to support writing.*

*SPS10. Students will investigate the properties of electricity and magnetism.*

***National Academic Standards (NATEF):***

*LA035 The technician attends to all written and oral directions that relate to the task or system under study.*

*MA228 The technician can analyze and solve problems requiring the use of fractions, decimals, ratios, or percentages by a direct or indirect variation of the numerical elements of the problem.*

*SC333 The technician can demonstrate an understanding of refraction as it occurs in systems that employ fiber optics.*

**ACT-ESD-7 Demonstrate knowledge of electrical accessory systems diagnosis and repair.**

***Academic Standards:***

*ELA11W3 The student uses research and technology to support writing.*

*SPS10. Students will investigate the properties of electricity and magnetism.*

***National Academic Standards (NATEF):***

*LA035 The technician attends to all written and oral directions that relate to the task or system under study.*

*MA228 The technician can analyze and solve problems requiring the use of fractions, decimals, ratios, or percentages by a direct or indirect variation of the numerical elements of the problem.*

## **ACT-ESD-8 Demonstrates knowledge of related physical science principles.**

### ***Academic Standards:***

*SPS6. Students will investigate the properties of solutions.*

*ELA10LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.*

### ***National Academic Standards (NATEF):***

*LA283 The technician uses computerized and other databases to obtain system information.*

*MA001 The technician can use Ohm's Law to determine circuit parameters that are out of tolerance.*

*SC341 The technician can explain in detail the three states of matter.*

## **ACT-ESD-9 Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures.**

### ***Academic Standards:***

*ELA11W3 The student uses research and technology to support writing.*

*SCSh9. Students will enhance reading in all curriculum areas.*

### ***National Academic Standards (NATEF):***

*LA286 The technician uses the service manual, in both database and hard copy formats, to identify the manufacturer's specifications for system operation and potential malfunctions.*

*SC194 The technician can demonstrate an understanding of the role of the generator in maintaining battery and system voltage.*

## **CTAE Foundation Skills**

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

**CTAE-FS-1 Technical Skills:** Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

**CTAE-FS-2 Academic Foundations:** Learners achieve state academic standards at or above grade level.

**CTAE-FS-3 Communications:** Learners use various communication skills in expressing and interpreting information.

**CTAE-FS-4 Problem Solving and Critical Thinking:** Learners define and solve problems, and use problem-solving and improvement methods and tools.

**CTAE-FS-5 Information Technology Applications:** Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

**CTAE-FS-6 Systems:** Learners understand a variety of organizational structures and functions.

**CTAE-FS-7 Safety, Health and Environment:** Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

**CTAE-FS-8 Leadership and Teamwork:** Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

**CTAE-FS-9 Ethics and Legal Responsibilities:** Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

**CTAE-FS-10 Career Development:** Learners plan and manage academic-career plans and employment relations.

**CTAE-FS-11 Entrepreneurship:** Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.