

TEAU 1600 - Electrical I (4 Credits)

Course Description

The Electrical I course provides theory and hands-on instruction on automotive electrical systems while following the program standards set forth by Automotive Service Excellence Education Foundation at the master level.

Course Objectives

- Maintain vehicle safety through safe electrical maintenance and repairs.
 - Identify and repair electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
 - Identify and repair the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
 - Identify and demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.
 - Identify and repair automotive electrical/electronic systems including battery systems, charging systems starting systems, and lighting systems.
-

Course Outline

- Intro to Automotive Electricity and Electronic Systems
 - Electrical and Electronic Theories and Components
 - Wiring, Circuit Diagrams, Batteries, and Starting Systems
 - Charging, Lighting, and Intro to Body Computers
 - Computer Inputs, Sensor Diagnostics, and Communications
 - Advanced Lighting and Instrumentation
 - Electrical Accessories and Infotainment Systems
 - Passive Restraint and Alternative Power Vehicles
-

Textbook & Reading Materials

Cengage Unlimited (1 year subscription), Cengage

Assignments and Assessments

Orientation	Lab 4 Measure source voltage and perform voltage drop test in a light circuit (Parallel circuit)
Orientation Acknowledgement	Lab 5 Measure current flow in a light circuit and component (Series circuit)
Electrical I Syllabus 2021-22	Lab 6 Demonstrate knowledge of the causes and effects from short to grounds
Remind Txt Group	Lab 7 Perform battery state of charge test
Automotive Student OE Instructions	Lab 8 Confirm proper battery capacity for vehicle, perform battery capacity and load test
Right to Know and Safety Agreement review	Lab 9 Perform slow/fast battery charge
Student Information Sheet	Read It: Chapter 02 Basic Theories
Cleaning Expectations	Chapter 02 Fill-in-the-Blank Questions
COVID-19 Policies and Procedures Agreement review	Chapter 02 Multiple Choice Questions
Electrical I Lab Assignment Checklist review	Read It: Chapter 03 Electrical and Electronic Components
Southwest Technical College Automotive Video Playlist	Chapter 03 Multiple Choice Questions
Student Tool and Equipment Use Waiver	Chapter 03 Fill-in-the-Blank Questions
Cell Phone	Read It: Chapter 03 Basic Electrical Troubleshooting and Service
Instructions	Chapter 03 ASE-Style Review Questions
Digital Lab Explanation	Chapter 03 ASE Challenge Questions
Module Breakdown	Testing for Opens
Module 1 Labs	Testing for Shorts
Module 2 Labs	Testing Relays
Module 3 Labs	Testing Switches
Module 4 Labs	Using the Lab Scope
Module 5 Labs	Using a Scan Tool
Module 6 Labs	Lab 10 Demonstrate knowledge of electrical circuits using (OHMS LAW)
Module 7 Labs	Lab 11 Demonstrate proper use of DMM when measuring current flow
Module 8 Labs	Lab 12 Demonstrate proper use of DMM when measuring resistance
Cleaning Lab Module	Lab 13 Check electrical circuits with a test light
Cleaning Lab 1	Lab 14 Check electrical circuit fuse a fused jump wire
Cleaning Lab 2	Lab 15 Demonstrate knowledge of the causes and effects from short to grounds
Cleaning Lab 3	Lab 16 Inspect and clean battery, ill cells, check cables, connectors, clamps and hold downs
Cleaning Lab 4	Lab 17 Inspect and test starter relays and solenoids
Cleaning Lab 5	Lab 18 Perform starting system output test
Read It: Chapter 01 Introduction to Automotive Electrical and Electronic Systems	Lab 19 Perform charging circuit voltage drop tests
Chapter 01 Multiple Choice Questions	Checkpoint Meeting Module 2
Chapter 01 Fill-in-the-Blank Questions	Read It: Chapter 04 Wiring and Circuit Diagrams
Read It: Chapter 01 Safety	Reading Wiring Diagrams
Chapter 01 ASE-Style Review Questions	Chapter 04 Multiple Choice Questions
Read It: Chapter 02 Special Tools and Procedures	Chapter 04 Fill-in-the-Blank Questions
Using Ohms Law	Read It: Chapter 04 Wiring Repair and Reading Wiring Diagrams
Series Circuits	Wire Stripping
Parallel Circuits	Crimping a Wire Connection
Series-Parallel Circuits	Soldering Wires
Applying Ohms Law	How to Solder Two Wires Together
Using the Voltmeter	Soldering Copper Wire
Voltage Drop Testing	
Using an Ohmmeter	
Chapter 02 ASE-Style Review Questions	
Chapter 02 ASE Challenge Questions	
Amperage Testing	
Fluke Meter	
Lab 1 Research vehicle service info	
Lab 2 Use wiring diagrams to trace electrical circuits	
Lab 3 Demonstrate proper use of DMM when measuring voltage	

Chapter 04 ASE-Style Review Questions
Chapter 04 ASE Challenge Questions
Read It: Chapter 05 Automotive Batteries
Chapter 05 Multiple Choice Questions
Chapter 05 Fill-in-the-Blank Questions
Read It: Chapter 05 Battery Diagnosis and Service
Testing Batteries
Battery Testing
How to Test and Replace a Bad Car Battery
Chapter 05 ASE-Style Review Questions
Chapter 05 ASE Challenge Questions
Read It: Chapter 06 Starting Systems and Motor Designs
Starting Systems
Starter Motor Construction
DC Motor: How It Works
Brushless DC Motor: How It Works
Chapter 06 Multiple Choice Questions
Chapter 06 Fill-in-the-Blank Questions
Read It: Chapter 06 Starting System Diagnosis and Service
How to Diagnose and Replace a Starter
Voltage Drop Testing a Starter Motor
Starting System Diagnostics
Chapter 06 ASE-Style Review Questions
Chapter 06 ASE Challenge Questions
Lab 20 Use wiring diagrams during diagnosis of electronic circuit
Lab 21 Use wiring diagrams during diagnosis of electronic circuit
Lab 22 Perform battery state of charge test
Lab 23 Confirm proper battery capacity for vehicle, perform battery capacity and load test
Lab 24 Perform slow/fast battery charge
Lab 25 Perform starter current draw test
Lab 26 Perform starter current draw test
Lab 27 Inspect and test starter relays and solenoids
Lab 28 Remove and install starter in vehicle
Lab 29 Disassemble, inspect, and reassemble starter motor, perform bench test
Checkpoint Meeting Module 3
Read It: Chapter 07 Charging Systems
Types of Hybrid Vehicle Power Systems
How does an Alternator Work?
How Does Diode Work?
How AC is Turned into DC
Chapter 07 Multiple Choice Questions
Chapter 07 Fill-in-the-Blank Questions
Read It: Chapter 07 Charging System Testing and Service
Charging Systems Test
How to Test an Alternator
Using an Ammeter
Charging System Diagnostics
Chapter 07 ASE-Style Review Questions
Chapter 07 ASE Challenge Questions
Read It: Chapter 11 Lighting Circuits

Head Light Circuits
Understanding the Difference between Projector and Reflect or Headlights
Multibeam Headlamp Technology
Matrix LED Headlight Technology Explained
How Laser Headlights Work
High-Intensity Discharge (HID) Bulbs Explained
How Automatic Headlights Work
How Automatic High Beams Work
Understanding Halogen Headlight Bulbs
Chapter 11 Multiple Choice Questions
Chapter 11 Fill-in-the-Blank Questions
Read It: Chapter 11 Lighting Circuits Diagnostics and Repair
Chapter 11 ASE-Style Review Questions
Head Lights
Lab 30 Measure current flow in a light circuit and component (Parallel circuit)
Lab 31 Inspect and clean battery, ill cells, check cables, connectors, clamps and hold downs
Lab 32 Perform starter current draw test
Lab 33 Perform charging system output test
Lab 34 Diagnose charging system for the cause of undercharge condition
Lab 35 Diagnose charging system for the cause of no charge condition
Lab 36 Diagnose charging system for the cause of overcharge condition
Lab 37 Inspect, adjust, or replace generator (alternator) drive belts, check pulleys & tensioners for wear and alignment.
Lab 38 Remove, inspect, and install generator (alternator)
Lab 39 Perform charging circuit voltage drop tests
Lab 40 Disassemble, inspect, and reassemble generator (alternator), perform bench tests
Lab 41 Inspect headlamps and sockets, replace as needed
Checkpoint Meeting Module 4
Read It: Chapter 08 Introduction to the Body Computer
Solenoid Basics Explained
How Relays Work
Actuators Explained
Chapter 08 Multiple Choice Questions
Chapter 08 Fill-in-the-Blank Questions
Read It: Chapter 08 Body Computer System Diagnosis
Testing the BCM and Power Ground Circuits
Flashing the BCM
Chapter 08 ASE-Style Review Questions
Chapter 08 ASE Challenge Questions
Read It: Chapter 09 Computer Inputs
How do Hall Effect Sensors Work?
Chapter 09 Multiple Choice Questions
Chapter 09 Fill-in-the-Blank Questions
Read It: Chapter 09 Sensor Diagnostic Routines
Diagnostic Strategies (8-Step Process)
Chapter 09 ASE-Style Review Questions
Chapter 09 ASE Challenge Questions

Read It: Chapter 10 Vehicle Multiplexing Diagnostics
Automotive Computer Networks
CAN Bus: Troubleshooting Common Problems
Chapter 10 Multiple Choice Questions
Chapter 10 Fill -in-the-Blank Questions
Read It: Chapter 10 Vehicle Communication Networks
Diagnosing Network Communication Problems
Chapter 10 ASE-Style Review Questions
Chapter 10 ASE Challenge Questions
Lab 42 Check electrical circuits with a test light
Lab 43 Check continuity and resistance in electrical circuit \ components
Lab 44 Check continuity and resistance in electrical circuit \ components
Lab 45 Check electrical circuit fuse a fused jump wire
Lab 46 Replace electrical connectors and terminals
Lab 47 Maintain or restore electronic memory functions
Lab 48 Inspect and test switches, connectors, and wires of started control circuits
Checkpoint Meeting Module 5
Read It: Chapter 12 Instrumentation and Warning Lamp Gauges
Chapter 12 Multiple Choice Questions
Chapter 12 Fill -in-the-Blank Questions
Read It: Chapter 12 Instrumentation and Warning Lamp System Diagnosis and Repair
Chapter 12 ASE-Style Review Questions
Chapter 12 ASE Challenge Questions
Lab 49 Measure source voltage and perform voltage drop test in a light circuit (Series circuit)
Lab 50 Measure source voltage and perform voltage drop test in a light circuit (Parallel circuit)
Lab 51 Inspect and test fusible links, circuit breakers, and fuses
Lab 52 Inspect, test, repair and/or replace components in electrical systems, determine needed action
Lab 53 Diagnose the causes of brighter-than-normal, intermittent, dim, or no light operation
Lab 54 Diagnose the causes of brighter-than-normal, intermittent, dim, or no light operation
Lab 55 Inspect turn signal/hazard flasher lamps and sockets, replace as needed
Lab 56 Inspect all exterior lamps and sockets (except headlamps and turn signals), replace as needed
Lab 57 Aim headlights
Lab 58 Demonstrate knowledge of the causes and effects from shorts to grounds
Checkpoint Meeting Module 6
Read It: Chapter 13 Accessories
Blower Motor Control
Multispeed Blower Circuit Operation
Chapter 13 Multiple Choice Questions
Chapter 13 Fill-in-the-Blank Questions
Read It: Chapter 13 Electrical Accessories Diagnosis and

Repair
Chapter 13 ASE-Style Review Questions
Chapter 13 ASE Challenge Questions
Read It: Chapter 14 Radio Frequency, Infotainment, and Connected Vehicle Technology
Vehicle Security Systems
Chapter 14 Multiple Choice Questions
Chapter 14 Fill-in-the-Blank Questions
Read It: Chapter 14 Servicing Radio Frequency and Infotainment Systems
Check Vehicle Security Systems
Chapter 14 ASE-Style Review Questions
Chapter 14 ASE Challenge Questions
Lab 59 Measure key-off battery drain (parasitic draw)
Lab 60 Measure key-off battery drain (parasitic draw)
Lab 61 Diagnose the cause of excessive key-off battery on (parasitic draw) determine
Lab 62 Inspect and test fusible links, circuit breakers, and fuses
Lab 63 Repair wiring harness, perform solder repair of electrical wiring
Lab 64 Identify electrical system components
Lab 65 Identify electronic modules, security systems, radios, and other accessories
Lab 66 Inspect, adjust, or replace generator (alternator) drive belts, check pulleys & tensioners for wear and alignment.
Lab 67 Inspect interior lamps and sockets, replace as needed
Lab 68 Demonstrate knowledge of the causes and effects from shorts to grounds
Checkpoint Meeting Module 7
Read It: Chapter 15 Passive Restraint and Occupant Safety Systems
Chapter 15 Multiple Choice Questions
Chapter 15 Fill-in-the-Blank Questions
Read It: Chapter 15 Servicing Passive Restraint and Occupant Safety Systems
Disarming an Airbag System
Chapter 15 ASE-Style Review Questions
Chapter 15 ASE Challenge Questions
Read It: Chapter 16 Advanced Driver Assistance Systems
Chapter 16 Multiple Choice Questions
Chapter 16 Fill-in-the-Blank Questions
Read It: Chapter 16 Servicing ADAS
Chapter 16 ASE-Style Review Questions
Chapter 16 ASE Challenge Questions
Read It: Chapter 17 HEV, EV, and Alternative Power Sources
Electric Vehicle Designs
Hybrid Vehicles
Types of Hybrid Vehicle Power Systems
General Hybrid Electric Vehicle Safety
Chapter 17 Multiple Choice Questions
Chapter 17 Fill -in-the-Blank Questions
Read It: Chapter 17 Hybrid and High-Voltage System Service
Preparing the HEV for Service

Chapter 17 ASE-Style Review Questions

Chapter 17 ASE Challenge Questions

Lab 69 Inspect, test, repair and/or replace components in electrical systems, determine needed action

Lab 70 Jump-start a vehicle using jumper cables and a booster battery or auxiliary power supply

Lab 71 Identify high voltage circuit of electric or hybrid electric vehicles and related safety precautions

Lab 72 Identify hybrid vehicles auxiliary (12v) battery service, repair and test procedures

Lab 73 Differentiate between electrical and mechanical problems that cause slow or no-crank

Lab 74 Demonstrate knowledge of an automatic idle-stop/start-stop system

Lab 75 Aim headlights

Lab 76 Identify system voltage and safety precautions for HID lighting systems

Lab 77 Demonstrate knowledge of the causes and effects from shorts to grounds

Checkpoint Meeting Module 8

End of Course Survey

Electrical Systems Competency Profile (2021)

Electrical 1 Review

Electrical 1 Final Exam

Subject to change. Please consult your Canvas course for the most current instructions and updates.

Classroom Hours

Mo, Tu, W, Th
8:00 AM - 12:00 PM
1:00 PM - 5:00 PM

Friday
8:00 AM - 12:00 PM

For a full list of course hours visit: [Course Schedule](#)

Instructor Contact Information

Cody Dawson — cdawson@stech.edu
Shad Esplin — sesplin@stech.edu
Dallin Robinson — drobinson@stech.edu
McKael Stapel — mstapel@stech.edu

Office Hours: By appointment

Email is the preferred method of communication; you will receive a response within 24 hours during regular business hours.

Canvas Information

Canvas is the where course content, grades, and communication will reside for this course.

- stech.instructure.com
- For Canvas passwords or any other computer-related technical support contact Student Services.
- For regular Hours and Weekdays call (435) 586 - 2899.
- For after Hours & Weekends call (435) 865 - 3929 (Leave a message if no response).

Course Policies

Class attendance is required, this is not an online course. Attendance is required during your scheduled time.

Grade Scale — A: 100 - 90%, B: 89 - 80%, F: 79% or lower.

Cell phones for many have become a distraction. When you are in class or lab we encourage you to keep your cell phones put away in a secure location. If you use ear buds we ask that you only use one so you can still hear the things going on around you. If you are using your phone for things other than school related items, instructors will ask you to put them away. Please follow the direction of your instructors. Those who have been asked to refrain from using your cell phone and fail to do so will be asked to meet with the Director of Transportation and student services will be notified.

The program is designed to provide the student with as much hands-on work as possible. In the automotive industry you may be required to lift heavy objects and stand for hours at a time to complete work required. Technicians deal with chemicals and materials which require caution, these will be identified in the Right to Know Agreement provided to you. You will also be required to use computers to track and complete work.

High School Power School Grades: Quarter student grades will be determined by student progress percentage. Faculty will use the higher percentage of either 1) quarter progress, or 2) cumulative progress for the current training plan year. The progress percentage will be used with the grading scale to determine the minimum grade. High School Grade Scale: The following grading scale will be used to determine a letter grade from the progress percentage:

- | | | | |
|-----------------|-----------------|-----------------|-----------------|
| • A : 94 - 100% | • B : 83 - 86% | • C : 73 - 76% | • D : 63 - 66% |
| • A- : 90 - 93% | • B- : 80 - 82% | • C- : 70 - 72% | • D- : 60 - 62% |
| • B+ : 87 - 89% | • C+ : 77 - 79% | • D+ : 67 - 69% | • F : 0 - 59% |

Additional Information

InformaCast Statement: Southwest Tech uses InformaCast to ensure the safety and well-being of our students. In times of emergency, such as weather closures and delays, this app allows us to promptly deliver notifications directly to your mobile devices. To stay informed and receive real-time updates, we encourage all students to sign up for notifications. Your safety is our priority, and staying connected ensures a swift response to any unforeseen circumstances. More information and directions for signing up are available at: <https://stech.edu/emergency-notifications/>

Internet Acceptable Use Policy: The student is expected to review and follow the Southwest Technical College Internet Safety Policy at: <https://stech.edu/students/policies/>

Student Code of Conduct Policy: The student is expected to review and follow the Southwest Technical College Student Code of Conduct Policy at: <https://stech.edu/students/policies/>

Accommodations: Students with medical, psychological, learning, or other disabilities desiring accommodations or services under ADA, must contact the Student Services Office. Student Services determines eligibility for and authorizes the provision of these accommodations and services. Students must voluntarily disclose that they have a disability, request an accommodation, and provide documentation of their disability. Students with disabilities may apply for accommodations, based on an eligible disability, through the Student Services office located at 757 W. 800 S., Cedar City, UT 84720, and by phone at (435) 586-2899. No diagnostic services are currently available through Southwest Technical College.

Safety and Building Maintenance: The College has developed and follows a variety of plans to ensure the safe and effective operation of its facilities and programs. The following plans are available online:

1) Facilities Operations and Maintenance Plan; 2) Technical Infrastructure Plan; and 3) Health and Safety Plan.

Withdrawals and Refunds: Please refer to the Southwest Technical College Refund Policy at: <https://stech.edu/students/policies/>

Any high school or adult student, who declares a technical training objective is eligible for admission at Southwest Technical College (Southwest Tech). Program-specific admissions requirements may exist and will be listed on the Southwest Tech website. A high school diploma or equivalent is not required for admission but is mandatory for students seeking Title IV Federal Financial Aid.

Non-Discriminatory Policy: Southwest Technical College affirms its commitment to promote the goals of fairness and equity in all aspects of the educational enterprise, and bases its policies on the idea of global human dignity.

Southwest Tech is committed to a policy of nondiscrimination. No otherwise qualified person may be excluded from participation in or be subjected to discrimination in any course, program or activity because of race, age, color, religion, sex, pregnancy, national origin or disability. Southwest Technical College does not discriminate on the basis of sex in the education programs or activities that it operates, as required by Title IX and 34 CFR part 106. The requirement not to discriminate in education programs or activities extends to admission and employment. Inquiries about Title IX and its regulations to STECH may be referred to the Title IX Coordinator, to the Department of Education, and/or to the Office for Civil rights.

If you believe you have experienced discrimination or harassment on our campus, please contact the Title IX Coordinator, Cory Estes: cestes@stech.edu, (435) 865-3938.

For special accommodations, please contact the ADA Coordinator, Cyndie Tracy: ctracy@stech.edu, (435) 865-3944.

Southwest Technical College

757 West 800 South

Cedar City, UT 84720

info@stech.edu

(435) 586-2899