SOUTHWEST TECH

SOUTHWEST TECHNICAL COLLEGE

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

Chapter 04 ASE-Style Review Questions
Chapter 04 ASE Challenge Questions
Read It: Chapter 05 Automotive Batteries
Chapter OS Multiple Choice Questions
Chapter OS Fill-in-the-Blank Questions
Read It: Chapter OS Battery Diagnosis and Service
Testing Batteries
Battery Testing
How to Test and Replace a Bad Car Battery
Chapter OS ASE-Style Review Questions
Chapter OS 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 Reflector 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
Ch;rnter 08 Multiole 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 t he 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 elect rical 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 elect rical circuit fuse a fused jump wire
Lab 46 Replace electrical connectors and terminals
Lab 47 Maintain or rest ore elect ronic memory functions
Lab 48 Inspect and test switches, connect ors, 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 t he causes of brighter-than-normal, intermittent, dim, or no light operation
Lab 54 Diagnose t he 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 t urn signals), replace as needed
Lab 57 Aim headlights
Lab 58 Demonstrate knowledge of t he 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-t he-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 Comnected 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 t he cause of excessive key-off battery on (par.asitic 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
I 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 boost er 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, r,epair and test procedures
Lab 73 Di fferentiate between electrical and mechanical problems t hat 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 t he 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. Work at home can be done on Canvas but 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%
- A- : 90 - 93%
- B+ : 87 - 89%
- B : 83 - 86%
- B- : 80 - 82%
- C+ : 77 - 79%
- C : 73 - 76%
- C- : 70 - 72%
- D+ : 67 - 69%
- D : 63 - 66%
- D- : 60 - 62%
- 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.
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