A. INTRODUCTION
   
   A. An aviation maintenance technician must understand the basic electrical 
   principles and how they apply to complex aircraft systems. This course is a 
   study of airframe electrical systems including installation, removal, 
   disassembly and repair of electrical components and related wiring. 
   Fundamental electrical safety will be addressed in every facet of this course.

   B. This is a required course of study for the Associate Degree of Applied Science 
   in Aviation Maintenance Technology.

   C. This course is occupationally related and serves as preparation for careers in 
   the field of Aviation Maintenance.

   D. Prerequisite: Successful completion of all required (G) general aviation 
   maintenance courses.

B. LEARNING OUTCOMES

   Upon successful completion of this course, Aircraft Electrical Systems, the student 
   will:

   Inspect and repair aircraft electrical systems components; crimp and splice 
   wiring to manufactures’ specifications; repair pins and sockets of aircraft 
   connectors; install, check and service airframe electrical wiring, controls, 
   switches, indicators and protective devices; inspect, check, troubleshoot, 
   service and integrated speed drive generators; and demonstrate proper 
   safety procedures. (C18,F1,F4,F5,F10,F12)

C. INSTRUCTIONAL MATERIALS

   A. The instructional materials identified for this course are viewable through 
   www.cted.edu/books

   B. Supplemental Reading: None

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D. COURSE REQUIREMENTS

The following will be required of each student for successful completion of this course:

A. Reading Assignment: Students are required to read assigned materials listed above in the required reading materials. Students are subject to announced and unannounced written and oral quizzes on reading material.

B. Projects: The following projects will be completed by students prior to completion of the final examination at the discretion of the instructor. Only after coverage of the subjects listed below by course material and students having been given the opportunity to practice these tasks, will students be required to demonstrate proficiency in these areas. (Projects will be assigned based in instructor’s discretion and availability of resources)

1. Select and use the correct test instrument to measure the current that flows through an electrical load specified by the instructor.

2. Explain the correct way to flash the field of an aircraft generator.

3. Demonstrate correct methods of troubleshooting an aircraft electrical circuit with the use of a multimeter.

4. Install a solderless terminal on a piece of electrical wire.

5. Identify switches, circuit breakers, wire splices, lamps and motors illustrated on an aircraft wiring diagram.

6. Given the current requirements and the length of the wire, select the smallest size wire that will carry the current without overheating or producing more than the allowable voltage drop.

7. Demonstrate to the instructor the correct way to tie an electrical wire bundle with spot ties.
8. Check the diodes in a DC alternator for opens or shorts.

9. Inspect the ground cable of the battery installed in an aircraft for condition, tightness of connections, and for evidence of corrosion.

10. Explain the correct procedure to adjust the voltage controlled by a vibrator-type voltage regulator.

C. Class performance: Students are required to attend all classes and to be in the classroom on time. The instructor can lower a student’s grade because of excessive tardiness. When absent from class for any reason, it is the student’s responsibility to arrange for and make up assignments missed during the absence.

D. Class Participation: Students will earn a satisfactory grade in the course by attending and regularly participating in class, giving complete attention to class activities, completion of all assigned work and successfully completing the examinations. Students are required to maintain a minimum GPA of 2.0 to receive a passing grade for the class and are encouraged to compute and monitor their GPA as the class progresses.

E. EXAMINATIONS

A. There will be three written examinations for this course covering all the lecture notes and reading material.

B. Practicum: Ten projects will be assigned by the instructor with a grade weight point of 10 points per project. See Projects (1-10) listed above. (based on available resources)

F. SEMESTER GRADE COMPUTATION

<table>
<thead>
<tr>
<th>EXAMINATIONS</th>
<th>POINTS</th>
<th>POINT TO GRADE RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXAM 1</td>
<td>250</td>
<td>900 - 1000 = A</td>
</tr>
<tr>
<td>EXAM 2</td>
<td>250</td>
<td>800 - 899 = B</td>
</tr>
<tr>
<td>EXAM 3 (final)</td>
<td>250</td>
<td>700 - 799 = C</td>
</tr>
<tr>
<td>Practicum/Projects 1-10</td>
<td>250</td>
<td>600 - 699 = D</td>
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<tr>
<td>TOTAL 1000</td>
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<td>0 - 599 = F</td>
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G. NOTES AND ADDITIONAL INSTRUCTIONS FROM COURSE INSTRUCTOR

A. Course Withdrawal: It is the student’s responsibility to officially drop a class if circumstances prevent attendance. In order to be officially withdrawn from the course, a student must obtain, complete and file an
Application for Withdrawal form with the College. The student’s transcript will show “W” or “F”, depending on whether the student was passing or failing at the time of withdrawal.

B. Administrative Withdrawal: Students not meeting course objectives or making satisfactory progress may be withdrawn from the course at the discretion of the instructor.

C. Cellular Phones and Beepers: Cellular phones and beepers will be turned off while the student is in the classroom or laboratory.

American’s with Disabilities Act (ADA): Disability Support Services provide services to students who have appropriate documentation of a disability. Students requiring accommodations for class are responsible for contacting the Office of Disability Support Services (DSS) located on the central campus. This service is available to all students, regardless of location. Explore the website at www.ctcd.edu/disability-support for further information. Reasonable accommodations will be given in accordance with the federal and state laws through the DSS office.

D. Instructor Discretion: The instructor reserves the right of final decision in course requirements.

F. Civility: Individuals are expected to be cognizant of what a constructive educational experience is and respectful of those participating in a learning environment. Failure to do so can result in disciplinary action up to and including expulsion.

H. COURSE OUTLINE

A. Module One: An introduction to aircraft electrical systems
   1. Learning Outcomes: upon successful completion of this module, the Student will:
      a. Describe aircraft electrical systems including a review of terms, general knowledge of electrical components, direct current power sources.
      b. Identify series, parallel and complex circuits.
      c. Discuss aircraft power circuits in detail, including battery, DC alternator, DC generator circuits and turbine engine starter generators.
2. **Learning Activities:**
   a. Successfully complete examination 1 covering material presented in this module. (C18, F1,F4, F5,F10,F12)
   
   b. Complete projects 1-4. (C18,F1,F4,F5,F10,F12)

3. **Equipment and Materials:**
   a. Multimeters, Variable DC power supply and bread board, soldiering pens (27-40 watt), solder, electrical soldiering paste, wire striping pliers, de-soldering braid and safety goggles.
   
   b. Assortment of electrical components: resistors, capacitors, diodes, transistors, SCRs, TRIACs, transformers, relays, circuit breakers and circuit boards

4. **Module Outline One: Introduction to aircraft electrical systems**
   a. Electrical system requirements.
   b. Electrical terms.
   c. Direct current and alternating current flow.
   d. Electrical system components.
   e. DC power sources, electrical load, basic electrical circuits
   f. Study circuit control devices, switches, semiconductor components, relays, solenoids, and bipolar transistors.
   g. Series, parallel and complex circuits.
   h. Battery powered circuits, protection devices and induced current protection
   i. Ground power circuit design and function
   j. Power generating systems
   k. Direct current alternator circuits
   
   l. Twin engine alternator systems using a shared voltage regulator
   m. Twin engine alternator systems using individual voltage regulators
   n. Direct current generator circuits
   o. Simple light aircraft generator systems
   p. Twin engine generator system using vibrator type voltage regulators
   q. Twin engine generator system using carbon-pile voltage regulators
   r. Turbine engine starter-generators
s. Voltage and current indicating systems

B. Module Two: Aircraft electrical load circuits and large aircraft electrical power systems

1. Learning Outcomes: upon successful completion of this module, the Student will:

a. Describe starter circuits, navigation, landing and taxi lighting systems.

b. Identify landing gear actuation, indicating circuits and anti-skid brake systems.

c. Identify propeller deicing systems, turbine engine auto ignition circuits, reciprocating engine starting and ignition circuits.

d. Describe split-bus circuits for avionics protection

2. Learning Activities:

Successfully complete examination 2 covering material presented in Module 2.  (C18,C20,F1-F6,F10)

3. Equipment and Materials:

Sample electrical schematic diagrams of electrical subsystems discussed in this Module.

4. Module Outline Two: Aircraft Electrical Load Circuits

a. Engine starter circuits
b. Navigation light circuits
c. Landing and taxi light circuits
d. Landing gear actuation and indicating circuits
e. Antiskid brake systems
f. Electrical propeller deicing systems
g. Turbine engine auto ignition circuits
h. Reciprocating engine starting and ignition circuits
i. Split-bus circuits for avionics protection
j. Large aircraft electrical power systems auxiliary power units

C. Module Three: Electrical system installation, troubleshooting, flowcharts and electrical component schematic symbols
1. **Learning Outcomes**: upon successful completion of this module, the Student will:

   a. Select correct wire gage for a given amperage and distance required for typical electrical component installation.

   b. Install wire terminals, splices, quick disconnect connectors, junction boxes, switches and circuit control devices.

   c. Apply wire bundle number codes to wire harnesses

   d. Perform systematic troubleshooting procedures

   e. Identify electrical components in schematic diagrams by electronic symbols.

2. **Learning Activities**:

   a. Successfully complete examination 3 covering material presented in Module 3. (C18,F1-F5,F10)

   b. Successfully complete projects 5-10. (C18,F1,F4,F5,F10,F12)

3. **Equipment and Materials**:

   a. Sample electrical schematic diagrams of electrical subsystems discussed in this Module.

   b. Multimeters, wire strippers, wire splices, wire, assorted connectors, pin insert and removal tools, crimping tools and wire terminals.

   c. Serviceable or unserviceable Airframe with electrical systems or subsystems accessible for hands on applications.

   d. Service manuals for the equipment stated above.

   e. Ground power unit to provide external power to the airframe or subsystems above.

4. **Module Outline Three**: Electrical system installation, troubleshooting, flowchart and schematic diagram reading

   a. Aircraft electrical system installation

   b. Electrical wire

   c. Selection of wire size

   d. Special types of wire
e. Terminals and connectors installation
   1. Quick- Disconnect connectors
   2. Terminal strips
   3. Wire terminals
   4. Wire splices
f. Wire identification
g. Wire bundling
h. Junction boxes
i. Wire installation
j. Circuit control and protection devices
   1. Switches
   2. Fuses and circuit breakers
k. Rules for systematic troubleshooting
l. An example of systematic troubleshooting
m. Troubleshooting review
n. Logic flowcharts for troubleshooting
o. Troubleshooting tools:
   1. Continuity lights
   2. Analog multi-meters
   3. Digital multi-meters
   4. Clamp-on-ammeters
   5. Oscilloscopes
p. Electronic symbols