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Aviation Maintenance Curriculum

Fundamentals of DC Electricity and Electronics Syllabus

About the Course:

The Fundamentals of DC Electricity course is designed to support the general knowledge and skill requirements identified in the Federal Aviation Administration's Mechanic Airman Certification Standards.

The course develops the fundamental electrical knowledge needed to understand, inspect, and troubleshoot aircraft electrical systems. It begins with the principles of matter, static electricity, magnetism, and electromagnetism and then applies these concepts to practical DC circuits. Learners examine voltage, current, resistance, power, circuit components, and series, parallel, and series parallel circuits while applying Ohm's Law and Kirchhoff's Laws to solve electrical problems.

The course also introduces electrical measuring instruments and the systematic use of meter readings and schematics to identify circuit faults. Finally, learners examine aircraft batteries, including their construction, characteristics, testing, charging, maintenance requirements, and safety considerations.

Together, these concepts provide aviation maintenance technicians with a foundation for safely analyzing, maintaining, and troubleshooting aircraft DC electrical systems.

Couse Number: FAA-ACS-AM-IA-DCE

ACS Reference: Fundamentals of Electricity and Electronics (AM.I.A)

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Course Objectives:	1. Explain the composition of matter and basic atomic structure. 2. Distinguish between protons, neutrons, and electrons. 3. Explain how electron movement affects a material's ability to conduct electricity. 4. Describe how static electrical charges are created. 5. Explain the attraction and repulsion of like and unlike charges. 6. Describe the characteristics of an electrostatic field. 7. Apply ESD precautions to protect electronic equipment. 8. Describe the characteristics of magnetism and magnetic forces. 9. Explain magnetic poles, magnetic flux, permeability, and reluctance. 10. Define electromagnetism and explain the relationship between electricity and magnetism. 11. Describe the characteristics and direction of magnetic field lines. 12. Use the Left-Hand Rule to determine magnetic field direction. 13. Explain how current and coil turns affect electromagnetic field strength. 14. Distinguish between voltage, current, and resistance and apply Ohm's Law to DC circuits. 15. Explain the factors that affect conductor resistance and interpret conductor size using American Wire Gauge. 16. Identify common sources of electricity and calculate electrical power. 17. Interpret basic electrical schematics and identify common circuit connections and components. 18. Identify fixed and variable resistors and determine resistor values using the color code. 19. Describe the purpose and operation of common circuit protection and control devices. 20. Identify common switch configurations and explain their use in electrical circuits. 21. Analyze series DC circuits and calculate total resistance, current, and voltage drops. 22. Apply Kirchhoff's Voltage Law and voltage-divider principles to series circuits.

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	23. Analyze parallel and series-parallel DC circuits and calculate resistance, voltage, and current. 24. Apply Kirchhoff's Current Law and current-divider principles to parallel circuits. 25. Describe capacitor operation and calculate capacitance and RC time constants in DC circuits. 26. Describe inductor operation and calculate inductance and RL time constants in DC circuits. 27. Compare series and parallel connections of resistors, capacitors, and inductors. 28. Differentiate among common DC electrical measuring instruments and identify what each measures. 29. Explain the basic function, operation, connection, and precautions of electrical measuring instruments. 30. Use meter readings and electrical schematics to identify and troubleshoot common circuit faults. 31. Distinguish between primary and secondary batteries and identify their components and characteristics. 32. Identify battery testing and charging methods and describe appropriate precautions for working with batteries. 33. Compare the characteristics, maintenance requirements, and safety considerations of common aircraft battery types.

Module 1: Fundamentals of Electricity

- Lesson 1.1 – Matter and Static Electricity
- Lesson 1.2 – Magnetism
- Lesson 1.3 – Electromagnetism

Module 2: DC Circuits

- Lesson 2.1 – Ohm's Law
- Lesson 2.2 – Electric Power
- Lesson 2.3 – Circuit Schematics and Resistors
- Lesson 2.4 – Circuit Protection and Control Devices

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- Lesson 2.5 – Series DC Circuits and KVL
- Lesson 2.6 – Parallel DC Circuits and KCL
- Lesson 2.7 – Capacitors in DC Circuits
- Lesson 2.8 – Inductors in DC Circuits

Module 3: Circuit Measuring Instruments

- Lesson 3.1 – DC Measuring Instruments
- Lesson 3.2 – Troubleshooting Circuits

Module 4: Batteries

- Lesson 4.1 – Introduction to Battery Types
- Lesson 4.2 – Lead-Acid Batteries
- Lesson 4.3 – Ni-Cad, SLA, and Lithium-ion Batteries

SkilRedi simulations included in this course:

- Circuit testing
- Lead-acid battery

Hands on labs

- DC Electrical Practical Fundamentals

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Each lesson contains the following:

- Lesson Objectives
- Video lecture
- Multiple readings with interactive animations
- Assigned readings in the applicable FAA 8083 Chapter
- Summary and Key Terms
- Assessment Activities

Each Module contains the following:

- Standards and Objectives
- Pre-Assessment
- Key Concepts and Terms
- Further Study
- Module Quiz
- Module Critical Thinking Activity
- Module Survey

Each Course contains the following:

- Course Pre-Test
- Course Introduction
- Course Comprehensive Assessment
- Course Survey

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