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Aviation Maintenance Curriculum

Fundamentals of AC Electricity and Electronics Syllabus

About This Course:

The Fundamentals of AC Electricity course introduces electrical and electronic principles used in aircraft systems and supports preparation for the electrical knowledge areas of the Federal Aviation Administration's Mechanic Airman Certification Standards.

The course begins with alternating current generation, waveform characteristics, and differences between AC and DC. Learners explore resistance, reactance, impedance, phase relationships, and resonance, applying electrical formulas to solve series and parallel AC circuit problems. Power, power factor, transformers, and inverters explain how electrical energy is transferred and converted to meet aircraft system requirements.

Building on these foundations, learners examine the construction, operation, regulation, and basic maintenance of generators, alternators, and AC and DC motors. The course also introduces semiconductors, diodes, rectifiers, transistors, filters, amplifiers, and logic circuits to explain how electronic systems control and process electrical signals.

Finally, learners explore DC and AC measuring instruments, including correct connections, measurement precautions, and interpretation of readings. Practical examples and calculations connect these topics to the inspection, maintenance, and troubleshooting of aircraft electrical systems.

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

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

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Course Objectives:

1. Differentiate AC from DC and explain how electromagnetic induction generates alternating voltage.
2. Describe AC waveform characteristics and distinguish instantaneous, peak, and effective (RMS) values.
3. Calculate generator output frequency from pole count and rotational speed.
4. Compare capacitor and inductor behavior, explain capacitive coupling, and calculate reactance in simple series and parallel arrangements.
5. Explain impedance and its relationship to resistance, reactance, and voltage-current phase.
6. Apply Ohm's law and phase relationships to solve series and parallel AC circuits and determine unknown resistance.
7. Calculate resonant frequency and explain resonance in series and ideal parallel LC circuits.
8. Distinguish true, reactive, and apparent power and calculate true power, apparent power, and power factor.
9. Explain transformer construction and operation and calculate ideal voltage and current relationships using turns ratios.
10. Identify transformer types and applications, including current-transformer installation and safety precautions.
11. Distinguish magnetic coupling from efficiency, describe transformer losses, and explain transformer use in power transmission.
12. Compare rotary and static inverters, explain their operating principles and output control, and describe their applications in aircraft AC power systems.
13. Differentiate AC from DC and explain how electromagnetic induction generates alternating voltage.
14. Describe AC waveform characteristics and distinguish instantaneous, peak, and effective (RMS) values.
15. Calculate generator output frequency from pole count and rotational speed.
16. Compare capacitor and inductor behavior, explain capacitive coupling, and calculate reactance in simple series and parallel arrangements.
17. Explain impedance and its relationship to resistance, reactance, and voltage-current phase.
18. Apply Ohm's law and phase relationships to solve series and parallel AC circuits and determine unknown resistance.

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19. Calculate resonant frequency and explain resonance in series and ideal parallel LC circuits.
20. Distinguish true, reactive, and apparent power and calculate true power, apparent power, and power factor.
21. Explain transformer construction and operation and calculate ideal voltage and current relationships using turns ratios.
22. Identify transformer types and applications, including current-transformer installation and safety precautions.
23. Distinguish magnetic coupling from efficiency, describe transformer losses, and explain transformer use in power transmission.
24. Compare rotary and static inverters, explain their operating principles and output control, and describe their applications in aircraft AC power systems.
25. Differentiate AC from DC and explain how electromagnetic induction generates alternating voltage.
26. Describe AC waveform characteristics and distinguish instantaneous, peak, and effective (RMS) values.
27. Calculate generator output frequency from pole count and rotational speed.
28. Compare capacitor and inductor behavior, explain capacitive coupling, and calculate reactance in simple series and parallel arrangements.
29. Explain impedance and its relationship to resistance, reactance, and voltage-current phase.
30. Apply Ohm's law and phase relationships to solve series and parallel AC circuits and determine unknown resistance.
31. Calculate resonant frequency and explain resonance in series and ideal parallel LC circuits.
32. Distinguish true, reactive, and apparent power and calculate true power, apparent power, and power factor.
33. Explain transformer construction and operation and calculate ideal voltage and current relationships using turns ratios.
34. Identify transformer types and applications, including current-transformer installation and safety precautions.
35. Distinguish magnetic coupling from efficiency, describe transformer losses, and explain transformer use in power transmission.

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36. Compare rotary and static inverters, explain their operating principles and output control, and describe their applications in aircraft AC power systems.
37. Differentiate AC from DC and explain how electromagnetic induction generates alternating voltage.
38. Describe AC waveform characteristics and distinguish instantaneous, peak, and effective (RMS) values.
39. Calculate generator output frequency from pole count and rotational speed.
40. Compare capacitor and inductor behavior, explain capacitive coupling, and calculate reactance in simple series and parallel arrangements.
41. Explain impedance and its relationship to resistance, reactance, and voltage-current phase.
42. Apply Ohm's law and phase relationships to solve series and parallel AC circuits and determine unknown resistance.
43. Calculate resonant frequency and explain resonance in series and ideal parallel LC circuits.
44. Distinguish true, reactive, and apparent power and calculate true power, apparent power, and power factor.
45. Explain transformer construction and operation and calculate ideal voltage and current relationships using turns ratios.
46. Identify transformer types and applications, including current-transformer installation and safety precautions.
47. Distinguish magnetic coupling from efficiency, describe transformer losses, and explain transformer use in power transmission.
48. Compare rotary and static inverters, explain their operating principles and output control, and describe their applications in aircraft AC power systems.

Module 1: Aircraft Alternating Current

- Lesson 1.1 – Introduction to Alternating Current (AC)
- Lesson 1.2 – Reactance in AC Circuits
- Lesson 1.3 – Ohm's Law for AC Circuits
- Lesson 1.4 – Power in AC Circuits and Transformers
- Lesson 1.5 – Inverters

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Module 2: Generators, Motors, and Alternators

- Lesson 2.1 – DC Generators
- Lesson 2.2 – Characteristics and Maintenance of Generators
- Lesson 2.3 – DC Motors
- Lesson 2.4 – AC Motors
- Lesson 2.5 – Alternators
- Lesson 2.6 – Generator and Alternator Regulation

Module 3: Electronics and Logic

- Lesson 3.1 – Semiconductors, Diodes, and Rectifiers
- Lesson 3.2 – Intro to Transistors
- Lesson 3.3 – Filtering
- Lesson 3.4 – Amplifiers
- Lesson 3.5 – Logic Circuits

Module 4: Measuring Devices

- Lesson 4.1 – Introduction to Measuring Devices
- Lesson 4.2 – AC Measuring Instruments

SkilRedi simulations included in this course:

- n/a

Hands on labs

- Basic Alternating Current (Sine Wave)

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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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