



# BROWARD COMMUNITY COLLEGE

## COURSE OUTLINE

**LAST REVIEW: 2008-2009**

*(i.e. 2003-2004)*

**NEXT REVIEW: 2013-2014**

*(i.e. 2008-2009)*

**STATUS: A**

*(A, I, D)*

**COURSE TITLE: Engine Electrical Systems & APU's**

**COMMON COURSE NUMBER: AMT 0420**

**CREDIT HOURS: 2**

**CONTACT HOUR BREAKDOWN**

*(per 16 week term)*

**CLOCK HOURS: 69.25**

*(Voc. Course ONLY)*

**Lecture: 31**

**Lab: 38.25**

**Clinic:**

**Other:**

**PREREQUISITE(S): None**

**COREQUISITE(S): None**

**PRE/COREQUISITE(S): None**

**COURSE DESCRIPTION** *(750 characters, maximum):* The course provides the knowledge and skills necessary to perform electrical repairs, installations, adjustments, and service. The subject area includes alternators, generators, voltage regulation, and paralleling of generators. The Student will be introduced to the operational principles of auxiliary power units. Student fee charged.

General Education Requirements – Associate of Arts Degree (AA), meets Area(s): Area

General Education Requirements – Associate in Science Degree (AS), meets Area(s): Area

General Education Requirements – Associate in Applied Science Degree (AAS), meets Area(s): Area

### UNIT TITLES

1. Electrical System Components
2. Engine Electrical Wiring, Controls, Switches, Indicators and Protective Devices
3. APU's



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## ASSESSMENT:

Please provide a brief description (250 characters maximum) that details how students will be assessed on the course outcomes.

1. Quizzes, Test, and/or Final Exam (cumulative/comprehensive);
2. Selected faculty may assess homework, projects, class participation/attendance, and/or extra credit projects. Upon successful completion of this course, the students should be able to perform electrical repairs, installations, adjustments and service.

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## UNITS

### Unit 1 Electrical System Components

#### General Outcome:

- 1.0 **The student shall:** The students should be able to repair engine electrical system components.

#### Specific Measurable Learning Outcomes:

**Upon successful completion of this unit, the student shall be able to:**

- 1.1 Check the condition of shunt and compound generator field circuits.
- 1.2 Locate and use overhaul information for electrical equipment.
- 1.3 Explain the procedures for correcting generator bush arcing.
- 1.4 Check a motor or generator armature to determine that the windings are not grounded.
- 1.5 Smooth the commutator surface of a motor or generator armature.
- 1.6 Determine the cause of solder deposits on the armature cover plate of a generator.
- 1.7 Describe the purpose of a ripple filter in a generator power circuit.
- 1.8 Describe the type of electric motor used with direct-cranking engine starters.

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- 1.9 List the types of voltage regulators used with high output direct current generators.
- 1.10 Explain the results of short or open circuits in a generator control circuit.
- 1.11 Describe the effect of sticking points in a reverse-current cutout relay.
- 1.12 Describe the method of providing and controlling the field current of aircraft generators.
- 1.13 Describe the methods of controlling parallel direct current generators.
- 1.14 Describe the methods used to control output frequency and voltage of alternating current generators.
- 1.15 Describe the methods of reducing armature reaction in aircraft generators.
- 1.16 Describe the methods of controlling current and voltage output of compound direct current generators.
- 1.17 Explain the operating principles of carbon-pile voltage regulators.
- 1.18 Explain the operating characteristics of series-wound direct current electric motors.
- 1.19 Describe the purpose and operation of reverse-current cutout relays in generator control circuits.
- 1.20 Explain the general operating characteristics of vibrator-type current and voltage regulators.
- 1.21 Flash a generator field.
- 1.22 Describe the effect of changes in speed and load on generator output.
- 1.23 List the design factors that determine the number of cycles per revolution an alternating current generator will produce.
- 1.24 Describe the factors that affect the torque produced by an electric motor.

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- 1.25 Explain the function of a commutator in a direct current electric motor.



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- 1.26 Determine the output frequency of an alternating current generator.
- 1.27 Describe the methods used to protect armature shafts from overloads.
- 1.28 Seat new or replacement generator brushes.
- 1.29 Explain the effect of incorrect generator brush spring tension on generator operation.
- 1.30 Describe the speed and load characteristics of series-, compound- and shunt-wound electric motors.
- 1.31 Explain the basic principles of electric generators.
- 1.32 Describe the basic internal electrical circuits of series-, compound- and shunt-wound generators.
- 1.33 Describe the applicability and use of intermittent-duty electric motors.
- 1.34 Describe the operating principles of magnetic clutches and brakes commonly used with electric motors.
- 1.35 Explain the requirements and methods for controlling a malfunctioning generator.
- 1.36 Describe the purpose and operation of reversible electric motors.



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### Unit 2 Engine Electrical Wiring, Controls, Switches, Indicators and Protective Devices

#### General Outcome:

- 2.0 The student shall:** The students should be able to install, check and service engine electrical wiring, controls, switches, indicators and protective devices.

#### Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 2.1 Describe the purpose, applicability and operation of electrical fused and circuit breakers.
- 2.2 List the types of electrical switches and their operation.
- 2.3 Install and wire electrical switches.
- 2.4 Splice wiring in engine electrical systems.
- 2.5 Describe the characteristics of high-tension and low-tension electrical wiring.
- 2.6 Describe the purpose, applicability and use of electrical wiring terminal strips.
- 2.7 Discuss the criteria for selecting aluminum and copper electrical cables.
- 2.8 Replace terminals on aircraft aluminum and copper electrical cables.
- 2.9 Describe types of switches and circuits used to control reversible electric motors.
- 2.10 Identify aircraft electric cables.
- 2.11 Determine the current-carrying capacity of an electrical circuit.
- 2.12 Install electrical wiring in conduits.

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- 2.13 Use electric cable selection chart for determining the correct cable to use in specified circumstances.
- 2.14 Describe the strength requirements for electric cable terminals.
- 2.15 Select and install electrical bonding jumpers.
- 2.16 Describe the installation and requirements for electrical junction boxes.
- 2.17 Describe the installation and wiring of solenoid-operated switches.
- 2.18 List the characteristics of single-wire electrical systems.
- 2.19 Describe the use of quick-disconnect electrical plugs and sockets.
- 2.20 Discuss the American Wire Gauge (A.W.G.) system of designating electrical wire sizes.
- 2.21 Describe the cause and effect of solenoid switch chatter.
- 2.22 Describe the method of providing direct current for battery charging on aircraft that operate only alternating current generators.
- 2.23 Explain the maximum permissible continuous load on the electrical system.
- 2.24 Discuss the sources of alternating current power in aircraft that operate only direct current generators.
- 2.25 Describe the operating principles and characteristics of transformers.
- 2.26 Determine the approximate continuous load on an aircraft electrical system.



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## Unit 3 APU's

### General Outcome:

**3.0 The student shall:** The student will understand the operating principles of various APU's.

### Specific Measurable Learning Outcomes:

**Upon successful completion of this unit, the student shall be able to:**

- 3.1** Understand the operating principles of APU starting and operation.
- 3.2** Understand the operating principles of APU's capable of producing hydraulic power.
- 3.3** Understand the operating principles of APU's capable of producing electric power.
- 3.4** Understand the operating principles of APU's capable of producing pneumatic power.