



BROWARD COMMUNITY COLLEGE

COURSE OUTLINE

LAST REVIEW: 2007-2008

(i.e. 2003-2004)

NEXT REVIEW: 2012-2013

(i.e. 2008-2009)

STATUS: A

(A, I, D)

COURSE TITLE: Propellers & Unducted Fans

COMMON COURSE NUMBER: AMT 2490

CREDIT HOURS: 2

CONTACT HOUR BREAKDOWN

(per 16 week term)

CLOCK HOURS: 89.25

(Voc. Course ONLY)

Lecture: 41

Lab: 48.25

Clinic:

Other:

PREREQUISITE(S): None

COREQUISITE(S): None

PRE/COREQUISITE(S): None

COURSE DESCRIPTION *(750 characters, maximum)*: This unit of instruction is designed to cover aircraft engine and turbo prop installations. Areas dealt with are: propeller fundamentals and terminology, synchronizing and ice control systems, identification and selection of propeller lubricants, balancing of propellers, propeller control systems, propeller governing systems, and installation, troubleshooting and removal of propellers. The theory of unducted fans is presented. 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. Propeller Synchronizing and Ice Control Systems
2. Lubricants
3. Balancing Propellers
4. Propeller Control System Components
5. Fixed Pitch, Constant Speed, and Feathering Propellers and Propeller Governing Systems
6. Installation, Troubleshooting, and Removal

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 install, balance, troubleshoot and remove propellers.



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Common Course Number: AMT 2490

UNITS

Unit 1 Propeller Synchronizing and Ice Control Systems

General Outcome:

- 1.0 The student shall:** The students should be able to inspect, check, service and repair propeller synchronizing and ice control systems.

Specific Measurable Learning Outcomes:

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

- 1.1 Describe the purpose of slinger rings on some propeller installations.
- 1.2 Explain the method of preventing ice formation on propeller spinners.
- 1.3 Describe the operating principles of electrical de-icing systems for propellers.
- 1.4 Describe the purpose of the governor step motor in the synchronizing system.
- 1.5 Describe the purpose of propeller synchronizing systems.
- 1.6 Explain the operating principles of synchronizing systems.
- 1.7 Explain the operating principles of fluid anti-icing systems.



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Unit 2 Lubricants

General Outcome:

- 2.0 The student shall:** The students should be able to identify and select propeller lubricants.

Specific Measurable Learning Outcomes:

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

- 2.1** List the principal requirements for propeller lubricants.
- 2.2** Describe the factors to be considered in selecting an oil or grease for a particular application.



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Unit 3 Balancing Propellers

General Outcome:

3.0 The student shall: The students should be able to balance propellers.

Specific Measurable Learning Outcomes:

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

- 3.1** Describe the effects of propeller unbalance on engine operation.
- 3.2** Detect and correct vertical and horizontal unbalance in a two-blade propeller.
- 3.3** Balance a two-blade propeller that uses a separate hub for mounting on the engine crankshaft.



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Unit 4 Propeller Control System Components

General Outcome:

- 4.0 **The student shall:** The students should be able to repair propeller control system components.

Specific Measurable Learning Outcomes:

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

- 4.1 Install oil control plugs in governors.
- 4.2 Use manufacturer's data to repair components.
- 4.3 Describe the purpose and operation of a propeller governor.
- 4.4 Explain the forces acting on a governor to produce speed control.
- 4.5 Determine the direction of rotation for which a propeller governor is set.



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Unit 5 Fixed Pitch, Constant Speed and Feathering Propellers and Propeller Governing Systems

General Outcome:

- 5.0 The student shall:** The students should be able to inspect, check, service and repair fixed-pitch, constant-speed and feathering propellers and propeller governing systems.

Specific Measurable Learning Outcomes:

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

- 5.1 Describe the purpose and function of the parts of a propeller.
- 5.2 Describe the aerodynamic forces and loads acting on a rotating propeller blade.
- 5.3 Describe the operating principles of propeller controls used with turbine engines.
- 5.4 Explain the meaning and significance of "static limits" as related to the installation of a fixed-pitch propeller.
- 5.5 Describe the purpose of the metal tipping on a wood propeller.
- 5.6 Measure propeller blade angle.
- 5.7 Define the meaning of propeller blade "back" and "face".
- 5.8 Describe the method of making changes in the speed and power output of an engine equipped with a constant-speed propeller.
- 5.9 Describe the operation of the distributor valve assembly of a hydromatic propeller.
- 5.10 Describe the normal position of a constant-speed propeller control during takeoff.
- 5.11 Explain the effect on engine operation of changing propeller pitch settings before a steady oil pressure is obtained after engine starting.



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- 5.12 Define the meaning and significance of "critical ranges" established for some engine-propeller combinations.
- 5.13 Describe the operation of a propeller during the feathering cycle.
- 5.14 Describe the operation of a propeller during the reversing cycle.
- 5.15 Explain the purpose of placing a propeller in a specified position prior to stopping the engine.
- 5.16 Explain the relationship between blade position, airspeed and angle of attack of the propeller blades.
- 5.17 Describe the operating principles of two-position and constant-speed counterweight propellers.
- 5.18 Describe the method of lubricating the pitch-changing mechanism of a hydromatic propeller.
- 5.19 Describe the method of checking a steel propeller hub or blade for cracks.
- 5.20 Explain the general procedure to be followed when using the chemical etching process to inspect aluminum alloy propeller blades.
- 5.21 Determine whether a bent aluminum alloy propeller blade can be repaired by cold straightening.
- 5.22 Clean and protect aluminum propeller blades.
- 5.23 Describe the procedure for treating minor nicks and scratches on aluminum propeller blades.
- 5.24 Determine the blade pitch stop settings on a variable-pitch propeller.
- 5.25 Describe the operating forces used to make blade pitch changes on various types of variable-pitch propellers.
- 5.26 Describe the location and purpose of propeller blade cuffs.
- 5.27 Describe the theory of unducted fans.



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Unit 6 Installation, Troubleshooting and Removal

General Outcome:

6.0 The student shall: The students should be able to install, troubleshoot and remove propellers.

Specific Measurable Learning Outcomes:

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

- 6.1 Perform an operational check of propeller feathering system.
- 6.2 Detect and correct front and rear cone bottoming of a propeller installed on a splined crankshaft.
- 6.3 Describe the purpose and use of snap rings on propeller installations.
- 6.4 Describe the purpose and use of propeller cones in some propeller installations.
- 6.5 Determine the amount of contact between a tapered crankshaft and the propeller hub.
- 6.6 Install and track a fixed-pitch and constant speed propeller.
- 6.7 Detect and correct looseness in a cable-operated propeller control system.
- 6.8 List the most likely indications of a damaged piston-to-dome seal in a hydromatic propeller.
- 6.9 Describe the most likely cause of oil leakage around the rear cone of a hydromatic propeller.
- 6.10 Perform an operational check of a propeller reversing system.
- 6.11 Explain the constant-speed propeller setting used when checking ignition systems.
- 6.12 Adjust a propeller governor so that the propeller will operate within the correct range.
- 6.13 Describe the purpose and significance of preloading the pitch-changing mechanism in a hydromatic propeller.