



MERCER
COUNTY COMMUNITY COLLEGE

COURSE OUTLINE

Course Number AVI 203	Course Title Aircraft and Engine Components	Credits 3
Hours: 3 Lecture	Prerequisites: College level Math and English Ability & CMN 112	Implementation Fall 2023

Catalog description:

Basic maintenance procedures, personnel, & regulations will be studied in conjunction with the fundamental components and systems of aircraft. Topics included in this course will be FAR's, personnel, inspections, data, aircraft engines, airframes, systems, operating procedures and limitations, instruments, and aircraft structures.

General Education Category:

Not GenEd

Course coordinator: (Name, telephone number, email address)

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Required texts & Other materials:

1. Aircraft Powerplants, Any Edition; Glencoe/McGraw-Hill Any Edition (ISBN 1264564465)
2. FAR'S: Parts 1, 21, 23, 33, 39, 43, 45, 65, 91, 121, 135, and 145 (Available online)

Course Student Learning Outcomes (SLO):

Upon successful completion of this course the student will be able to:

1. Explain the design, function and operation of aircraft engines, engine instruments, and maintenance operations and personnel used to repair modern aircraft. **(PLO 1,4,5,6) (ILG 1,2,3,4,9)**
2. Understand the inspections and personnel that are related to aircraft and be able to explain the operations of various aircraft engine components and instruments. **(PLO 1,4,5,6) (ILG 1,2,3,4,9)**

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 1. Written and Oral Communication in English. Students will communicate effectively in both speech and writing.

Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Institutional Learning Goal 3. Science. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Institutional Learning Goal 9. Ethical Reasoning and Action. Students will understand ethical frameworks, issues, and situations.

Program Learning Outcomes for Aviation Technology (PLO)

1. Demonstrate the knowledge and skills required to obtain the private and commercial certificates and instrument rating, including aeronautical technical skills and decision-making, while demonstrating safety as their primary focus
4. Demonstrate effective and correct written and verbal communication.
5. Research and present information pertinent to their aviation discipline individually and in teams.
6. Demonstrate an awareness of the ethical and professional issues associated with the aviation industry, including the importance of becoming a life-long learner in the aviation world.

Units of study in detail – Unit Student Learning Outcomes:

Unit I -- INSPECTIONS, MAINTENANCE PROCEDURES, AIRCRAFT MAINTENANCE, PERSONNEL AND FORCES ACTING ON AN AIRCRAFT

[Supports Course SLOs #1 and #2]

The student should be able to explain:

- | | |
|--------------------------------|---------------------------|
| a. Annual Inspection | l. Major Overhaul |
| b. 100 HR. Inspection | m. Top Overhaul |
| c. Progressive Inspection | n. Alteration |
| d. Continuous Inspection | o. Minor Repair |
| e. A&P | p. Major Repair |
| f. Inspection Authorization | q. Repair Station |
| g. Type Certificate Data Sheet | r. Forces on an Aircraft |
| h. Specifications | s. Inoperative Equipment |
| i. Listings | t. Minimum Equipment List |
| j. STC | u. Yield Point |
| k. TSO | v. Ultimate Strength |

The student should be able to differentiate between the various types of inspections an aircraft can undergo; understand the various maintenance facilities where repairs are made; and explain the forces an aircraft is subjected to in flight.

Unit II -- THE AIRCRAFT PISTON ENGINE AND SYSTEMS

[Supports Course SLOs #1 and #2]

The student should be able to define:

- a. Horsepower
- b. Indicated horsepower
- c. Brake or shaft horsepower
- d. Compression ratio'
- e. BMEP
- f. METO Power

The student should be able to:

- a. Describe the fundamentals of how a piston engine produces power.
- b. Describe the difference between liquid and air cooled engines.
- c. Describe the general configuration of in-line, opposed and radial engines.
- d. Describe the principal parts of a piston engine.
- e. Define the types of bearings used in engines and the qualities that they possess.
- f. Describe the difference in appearance between an intake valve and an exhaust valve.
- g. Know and understand the internal components in the wet and dry lubrication systems .
- h. Describe the principal features of an aircraft piston engine ignition system.
- i. Describe and know the difference between a supercharger, turbocharger and a turbo-supercharger.
- j. Understand the four stroke, five event Otto cycle.
- k. Explain how a propeller converts engine power into thrust.
- l. Describe and understand the various types of aircraft propellers in use.

The student should be able to describe the following accessories and systems used in aircraft.

- a. Starting systems,
- b. Engine driven generators and alternators
- c. Ignition systems
- d. Lubricating systems
- e. Fuel supply systems
- f. Carburetion and fuel injection
- g. Landing gear and brake systems
- h. Electrical system distribution and devices

Unit III --AIRCRAFT JET ENGINES

[Supports Course SLOs #1 and #2]

The student should be able to:

- a. Describe the main components of a gas turbine engine.
- b. Describe the construction of stator and rotor blades and their function in the engine.
- c. Describe the instruments that measure thrust in a gas turbine engine.
- d. Understand and explain how a jet engine operates.
- e. Define the parameters of jet engine operations and monitoring.
- f. Describe the differences between pure jet, pulse jet, ramjet, turboprop, bypass engines, turbofan engines.
- g. Describe what a water injection system is and what it does.
- h. Describe the centrifugal and axial flow engine.
- i. Describe an afterburner and its operation.

Unit IV --AIRCRAFT AND FLIGHT INSTRUMENTS -

[Supports Course SLOs #1 and #2]

The student should be able to describe the construction, principle of operation, accuracy and reliability of the following engine instruments and systems:

(Referenced flight instruments may also be included)

- a. Pilot-static systems
- b. Pressure altimeters
- c. Vertical speed indicators
- d. Airspeed indicators
- e. Air temperature gauges
- f. Angle of attack indicator
- g. Magnetic compasses
- h. Gyroscopes
- i. Tachometers
- j. Manifold pressure gauges
- k. Engine temperature and pressure ratio gauges
- l. Fuel management

Evaluation of student learning:

Three announced quizzes 75% (25% each), Final Exam 25%, Classroom Participation and other assignments will be taken into account.

COURSE GRADES

Letter grade	Nominal %	QPA quality points
A	93-100	4.0
A-	90-92	3.7
B+	87-89	3.4
B	83-86	3.0
B-	80-82	2.7
C+	77-79	2.4
C	70-76	2.0
D	60-69	1.0
F	0-59	0.0