Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 207 Weight and Balance

Credit Hours: 2.50 **Lecture Periods:** 1.25 **Lab Periods:** 3.75

Description:

Preparation of aircraft for weight and balance. Includes service and maintenance manuals, type certificate data sheets, standard weight and balance practices, weighing an aircraft, calculating center of gravity, and correction of out of balance conditions. Also includes addition and subtraction of equipment, equipment lists, flight manual updates, control surface balancing, identification and selection of standard hardware, installation and assembly of specialty hardware, and use of precision measuring equipment.

Prerequisite(s): GTM 105V.

Course Learning Outcomes:

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

1. Discuss terms and principles of weight and balance operating. (Level 1)
2. Use manufacturer reference manuals and associated documents. (Level 3) Ref. Title 14 CFR Part 147, App. B, C.12
3. Identify and demonstrate proper jacking procedures for a given aircraft. (Level 3) Ref. Title 14 CFR Part 147, App. B C.12
4. Weighing a given aircraft. (Level 2) Ref. Title 14 CFR Part 147, App. B, C.11, 12
5. Calculate the empty weight and center of gravity of a given aircraft. (Level 3) Ref. Title 14 CFR Part 147, App. B, C 12
6. Calculate extreme forward and aft center of gravity conditions. (Level 3) Ref. Title 14 CFR Part 147, App. B, C 12
7. Calculate the addition and removal of equipment. (Level 3) Ref. Title 14 CFR Part 147, App. B, C, 12
8. Prepare load documentation, equipment lists, and flight manual updates. (Level 2) Ref. Title 14 CFR Part 147, App. B, C, 12
9. Explain the application of weight and balance principles to specialty aircraft.
10. Identify and select aircraft AN, MS and NAS hardware. (Level 3) Ref. Title 14 CFR Part 147, App. B, E, 17
11. Identify and select the proper methods to install and secure aviation hardware. (Level 3) Ref. Title 14 CFR, Part 147, App. B. E, 17
12. Use precision measuring tools. (Level 3) Ref. Title 14 CFR, Part 147, App. B E.19

Outline:

I. Weight and Balance Terms
   - A. Datum
   - B. Arm
   - C. Moment
   - D. Center of gravity (CG)
   - E. Maximum weight
   - F. Empty weight (EW)
   - G. Useful load
   - H. EWCG
   - I. EWCG range
   - J. Operating CG range
   - K. Mean aerodynamic chord (MAC)
   - L. Leveling means
   - M. Weighing points
   - N. Zero fuel weight

O. Minimum fuel
P. Full oil
Q. Tare weight

II. Theory
A. Need for weighing
B. Flight operational concerns
C. Controllability
D. Safety of flight
E. Principles of weight and balance

III. Equipment
A. Scales
B. Facility
C. Measuring tools
D. Stands

IV. Technical Data
A. Aircraft specifications and type certificate data sheets
B. Operating limitations and flight manual
C. Service and maintenance manuals
D. Equipment list
E. Weight and balance report

V. Weighing Procedures
A. Preparation of aircraft
B. Scale placements
C. Measurements
D. Leveling
E. Precautions and safety

VI. Balance Computations (4.0 class/4.0 lab hours)
A. Empty weight
B. Empty weight CG
C. Forward CG balance check
D. Rearward CG balance check
E. Maximum loading conditions

VII. Loading Documentation
A. Weight and balance report
B. Updating equipment list
C. Updating flight manual
D. Log book

VIII. Special Aircraft
A. Helicopter
B. Glider
C. Hot air balloon

IX. Aircraft Hardware
A. General
1. Standards
2. Terms
3. Thread classification
4. Class of fit
5. Identification
B. Threaded Fasteners
1. General purpose
2. Close tolerance
3. Internal wrenching
4. Coding
5. Special purpose
6. Lock bolts
C. Aircraft Nuts
1. Self-locking
2. Non self-locking

3. Safety type
4. Anchor types

D. Aircraft Washers
1. Plain
2. Locking
3. Special

E. Torque
1. Theory
2. Equipment
3. Application

F. Aircraft Screws
1. Head styles
2. Thread styles
3. Structural
4. Machine
5. Self-taping
6. I.D. and coding

G. Aircraft Rivets
1. Types
2. Alloys
3. Installation
4. Pull rivets
5. Self-plugging

H. Special Hardware
1. Studs
2. Bushings
3. Heli-coil
4. Heli-coil installation
5. Daus fastener systems
6. Southco. fastener systems
7. Camloc fastener systems
8. Airloc fasteners system

I. Control Cable
1. Construction
2. Materials
3. End fittings
4. Turn buckles

X. Safety Provisions
A. Cotter pins
B. Clevis pins
C. Roll pins
D. Snap rings
E. Safety wire

XI. Precision Measuring Equipment
A. Micrometer caliper
B. Dial indicator
C. Telescopic gauges
D. Slide caliper

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 102 Structural Repair II

Credit Hours: 4.00 **Lecture Periods:** 2.00 **Lab Periods:** 6.00

Description:

Continuation of AVM 101. Includes safety, bend allowance, layout, fasteners, machine usage, patching techniques and structural repair techniques.

Prerequisite(s): AVM 101 or 105.

Course Learning Outcomes:

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

1. Calculate bend allowance mathematical determinations and perform layout in preparation for bending.
2. Demonstrate equipment set-up and equipment operation for required bend allowance specifications.
3. Describe use and safety requirements for bending, rolling, cutting, dimpling, squeeze riveting and shaving equipment.
4. Identify structural fasteners by type, use, and size.
5. Demonstrate installation procedures for structural fasteners.
6. Describe shear, tensile and bearing strength analysis techniques required in the layout of structural repairs.
7. Demonstrate several types of structural repairs to an aircraft.

Outline:

I. Bend Allowance
   - A. Mathematical determination
   - B. Layout
   - C. Radius requirements
   - D. Equipment set-up
   - E. Bending procedures

II. Machine Safety and Use
   - A. Cornice brake
   - B. Box and pan brake
   - C. Slip rolls
   - D. Contour band saw
   - E. Dimplings

III. Structural Fasteners
   - A. Function
   - B. Use
   - C. Size
   - D. Installation

IV. Strength Analysis Techniques
   - A. Shear
   - B. Tensile
   - C. Bearing

V. Fabrication from a Blueprint
   - A. Hand forming
   - B. Joggling
   - C. Shrinking

VI. Stretching
   - A. Stress Relieving
   - B. Clean up

VII. Structural Repairs
   A. Fuselage Repair - Flat
   B. Fuselage Repair - Curved
   C. Frame Repair
   D. Stringer Repair
   E. Sheet Replacement
   F. Section Replacement

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 105 Aircraft Sheetmetal Repair

Credit Hours: 4.00 **Lecture Periods:** 2.00 **Lab Periods:** 6.00

Description:

Principles and procedures for fuselage, wing, and empennage sheetmetal repair. Includes safety, hand tools, layout methods, materials, fasteners, repair techniques, parts fabrication, and corrosion prevention and control.

Course Learning Outcomes:

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

1. Describe safety rules as applied to handtools, sheetmetal machines and material handling. (Level 2)
2. Describe the proper use of handtools, sheetmetal machines, cutting and measuring tools. (Level 1)
3. Perform sheetmetal layout methods and repair operations to the standards of the appropriate structural repair or maintenance manual. (Level 3) Ref. Title 14 CFR Part 147, App. C, I, D.16
4. Describe the use of aircraft structural materials, alloying, material characteristics and the effects of heat treatment. (Level 2)
5. Identify and demonstrate selection, installation and removal of blind, solid and special fasteners. (Level 3) Ref. Title 14 CFR Part 147, App. C, I, D, 10, 15
6. Demonstrate the proper inspection and repair methods for aircraft metal structures. (Level 3) Ref. Title 14 CFR, Part 147, App. C, I, D. 14
7. Demonstrate parts fabrication using forming, rolling, shearing, shrinking/stretching and bending techniques. (Level 3) Ref. Title 14 CFR, Part 147, App. C, I, D 16
8. Identify types of corrosion and demonstrate corrosion removal and treatment. (Level 2)

Outline:

I. Safety
   - A. Handtools
   - B. Shop
   - C. Sheetmetal machines
   - D. Safety around aircraft
   - E. Materials handling

II. Handtools and Equipment Used in Sheetmetal Repair
   - A. Basic mechanic handtools
   - B. Sheetmetal mechanic handtools
   - C. Forming, shearing and bending equipment

III. Basic Sheetmetal Layout Methods and Repair Operations
   - A. Blueprint review
   - B. Mathematical determination of fastener placement
   - C. Measuring tools
   - D. Inspection methods

IV. Aircraft Structural Materials
   - A. Aluminum designations
   - B. Alloying
   - C. Material characteristics
   - D. Heat treatments

V. Aircraft Fasteners
   - A. Solid
   - B. Blind
   - C. Special
   - D. Installation and removal techniques

VI. Aircraft Repair Techniques
    A. Single Pilot Resource Management (SRM) usage
    B. Maintenance manuals
    C. Scab repairs
    D. Flush repairs
    E. Splicing repairs
    F. Built up repairs
VII. Parts Fabrication
    A. Forming
    B. Rolling
    C. Shearing
    D. Shrinking and stretching
    E. Bend allowance and bending
VIII. Corrosion Prevention and Control
    A. Types
    B. Identification
    C. Removal
    D. Treatment

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Spring 2010

AVM 110 Aircraft Blueprint Reading

Credit Hours: 3.00 **Lecture Periods:** 3.00 **Lab Periods:**

Description:

Theory and application of aircraft blueprint reading. Includes types of aircraft drawings, measuring tools, drawing and lay-out equipment, types of views, projections, reference lines, drawing format, title block, manufacturing codes, symbology for fasteners, hardware, and materials. Also includes production of aircraft drawing, sketches, usage of aircraft schematics, graphs, charts, detail, assembly and exploded diagrams.

Course Learning Outcomes:

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

1. Identify types of aircraft drawings. (Level 2) Ref. Title 14 CFR Part 147, App. B, B, 7
2. Interpret manufactures' codes for hardware, fasteners, symbology, terms and basic materials used in aircraft construction. (Level 2) Ref. Title 14 CFR Part 147, App. B, B.7
3. Identify and interpret aircraft reference points. (Level 2) Ref. Title CFR Part 147 App. B, B,7
4. Identify drawing lines, reference lines, views and projections. (Level 3) Ref. Title CFR Part 147, App. B, B,7,9
5. Interpret aircraft blueprints for repairs, installations, modifications and conformity. (Level 3) Ref. Title 14 CFR Part 147, App. B, B,7,9
6. Identify and demonstrate the use of drawing and layout tools. (Level 3) Ref. Title 14 CFR Part 147, App. B, B 7,9,10
7. Interpret and apply aircraft blueprints, schematics, graphs and charts. (Level 3) Ref. Title 14 CFR Part 147, App. B, B 7,9,10
8. Demonstrate proficiency in interpreting dimensions, tolerances, general and footnotes. (Level 3) Ref. Title 14 CFR Part 147, App. B, B,9.
9. Demonstrate proficiency in producing orthographic, isometric drawings and sketches of aircraft components. (Level 3) Ref. Title 14 CFR Part 147, App. B, B 8,9

Outline:

I. Basic Concepts of Blueprint Layout (0.5 class hours)
   - A. History
   - B. Manufacturing usage
   - C. Repair and modification C.A.D. drawings

II. Measurement Tools (2.0 class hours)
   - A. Scale reading in 1/16 inch, 1/10 inch increments
   - B. Micrometer reading
   - C. Measurement transfer tooling

III. Drawing and Layout Equipment (1.0 class hours)
   - A. Dividers
   - B. T-square
   - C. Triangles
   - D. Compass
   - E. Curves
   - F. Templates

G. Radius gauges

IV. View and Projections (1.0 class hours)
- A. Perspective
- B. Oblique
- C. Isometric

V. Types of Drawing Lines (4.0 class hours)
- A. Object
- B. Hidden
- C. Phantom
- D. Centerline
- E. Extension
- F. Dimension
- G. Cutting plane
- H. Leader

VI. Reference Lines (2.0 class hours)
- A. Water line (WL)
- B. Buttock line (BL)
- C. Fuselage station (FS)
- D. Wing station (WS)
- E. FFS front spar station
- F. Wing buttock line (SBL)
- G. Mean aerodynamic chord (MAC)
- H. Leading edge (L.E.)
- I. Trailing edge (T.E.)
- J. Zone diagrams
- K. Body section
- L. Access doors and panels

VII. Types of Drawings (4.0 class hours)
- A. Detail
- B. Assembly
- C. Installation
- D. Production
- E. Schematics
- F. Exploded diagrams

VIII. Drawing Format (4.0 class hours)
- A. Nomenclature
- B. Drawing number
- C. Numbering of pages
- D. Scale
- E. Revisions
- F. Left and right parts
- G. Part numbers
- H. Approvals
- I. Zoning
- J. List of materials

IX. Drawing Techniques (10.0 class hours)
- A. Pencil lines
- B. Use of compass
- C. Use of the T-square
- D. Use of dividers
- E. Dimensioning and tolerances
- F. Lettering
- G. Title block development

H. Sketches

X. Production and Repair Standards Usage (0.5 class hours)
   A. Military standards (MS)
   B. Structural repair manuals
   C. Army Navy (AN)

XI. Aircraft Blueprint Interpretations (3.0 class hours)
   A. Use of prints for transfer of information
   B. Interpretation of the presented format
   C. Interpretation of charts and graphs
   D. Applicability of notes and instructions

XII. Charts and Graphs
   A. Typical layout
   B. Usage

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 130 Aircraft Composite Repair

Credit Hours: 4.00 **Lecture Periods:** 2.00 **Lab Periods:** 6.00

Description:

Construction and repair processes using advanced composite materials. Includes reinforcing fibers, matrix and core materials, manufacturing of components, composite safety, curing wet layup and prepreg repairs, tools and equipment, and inspection and damage assessment.

Information: Consent of instructor is required before enrolling in this course.

Course Learning Outcomes:

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

1. Identify and describe the major types of plastics and composite reinforcing material used in aircraft construction. (Level 1)
2. Perform fabrication of both monolithic and sandwich laminate construction using thermo-setting epoxies. (Level 3)
3. Demonstrate proficiency in the use of personal safety equipment while using chemicals, solvents and machining techniques. (Level 3)
4. Describe the standard manufacturing methods of plastic and composite components to include pressure, heat, lighting protection and finishing. (Level 1)
5. Demonstrate inspection and test methods used for components made of fiberglass, composite, laminated primary and secondary structure and plastics. (Level 2) Ref. Title 14 CFR, Part 147. App C, I, D.12
6. Demonstrate knowledge of manufacturing and inspection of bonded structures. (Level 2) Ref. Title 14 CFR, Part 147 App C, I, D.11
7. Demonstrate knowledge in the selection, installation and removal of special fasteners for bonded and composite structures. (Level 2) Ref. Title 14, CFR, Part 147 App. C, I, D.10
8. Demonstrate proficiency in repairs of fiberglass, honeycomb composite laminated primary and secondary structures and plastics. (Level 2) Ref. Title 14 CFR, Part 147 App. C, I, D.12
9. Demonstrate proficiency in the inspection, checks, servicing and repairs of windows, doors and interior furnishings. (Level 2) Ref. Title 14 CFR, Part 147 App. C, I, D.13

Outline:

I. Types and Applications of Reinforcing Fibers
   - A. Fiberglass cloth
   - B. Aramid fabrics
   - C. Carbon graphite
   - D. Fiber placement
   - E. Fiber usage
   - F. Fabric styles
   - G. Ply orientation

II. Matrix Materials
   - A. Matrix systems
   - B. Thermo sets
   - C. Thermo plastics
   - D. Lay-ups
     1. Wet
     2. Prepreg

III. Core Materials
   - A. Honeycomb

- B. Foam cores
- C. Wood cores

IV. Manufacturing of Components
- A. Heat and pressure
- B. Manufacturing methods
- C. Lighting protection
- D. Electrical bonding
- E. Composite part finishing

V. Composite Safety
- A. Material safety data sheets
- B. Personal safety with chemicals
- C. Solvents: usage and safety
- D. Personal safety while machining

VI. Curing and Repairs
- A. Room temp cures
- B. Vacuum bagging
- C. Heat curing - hot bonders
- D. Heat curing - oven

VII. Tools and Equipment
- A. Cutting fabrics
- B. Machining cured composites
- C. Machining acrylics
- D. Facilities

VIII. Assessment of Damage
- A. Classification of damage
- B. Types of damage
- C. Inspection methodology
- D. Repair operations
- E. Repair procedures

IX. Types of Repairs
- A. Declamation
- B. Disbonding
- C. Typical repair procedures
- D. Damage to monolithic laminate structure
- E. Repairs to honeycomb structures
- F. Repairs to thermoplastics

X. Repair Procedures
- A. Structural Repair Manual (SRM) procedures
- B. Fiberglass monolithic lay-up
- C. Fiberglass sandwich lay-up
- D. Aramid fiber sandwich lay-up
- E. Carbon fiber sandwich lay-up
- F. Single sided step sand repair
- G. Single sided scarf repair
- H. Double sided scarf repair
- I. Edge band repair
- J. Thermo plastic bond
- K. Fastener installations

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 150 Structural Repair III

Credit Hours: 4.00 **Lecture Periods:** 2.00 **Lab Periods:** 6.00

Description:

Continuation of AVM 102. Includes repair publications, materials handling, cable fabrication, machining processes, protective coatings, hand forming and structural repair processes.

Prerequisite(s): AVM 102.

Course Learning Outcomes:

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

1. Demonstrate the use of the Structural Repair Manual (SRM), Illustrated Parts Catalog (IPC), Service Bulletins (SBs), Airworthiness Directives (ADs), Supplemental Type Certificates (STCs), and Engineering Orders (EOs).
2. Describe the methods of material handling and material verification.
3. Describe and demonstrate drilling, reaming, heli-coil installation, routing, spot facing, counter boring, torqueing, and jigging.
4. Describe and demonstrate coating applications.
5. Describe and demonstrate hand forming of flanges, concave curvatures, and convex curvatures.
6. Describe layout procedures and perform dent repair, web repair, skin repair, and spar repair.

Outline:

I. Repair Publication Use
   - A. SRM
   - B. IPC
   - C. SBs
   - D. ADs
   - E. STCs
   - F. EOs
   - G. Blueprint reading

II. Materials Handling and Verification
   - A. Rules of handling sheetmetal
   - B. Importance of verification
   - C. Methods of verification
   - D. Hardness testing identification

III. Special Machining Processes
   - A. Drilling and reaming tooling
   - B. Drilling and reaming of close tolerance hardware and fittings
   - C. Rivet shaver
   - D. Routing procedures
   - E. Spot facing application and tooling
   - F. Spot facing procedures
   - G. Counter boring application and tooling
   - H. Counter boring procedures
   - I. Torque applications
   - J. Jig and fixture building

IV. Protective Coatings
   - A. Alodine treatment
   - B. Anodizing

C. Primers and applications
D. Final coatings and application

V. Hand Forming
A. Tooling fabrication
B. Forming flanges
C. Forming concave curvatures
D. Forming convex curvatures

VI. Repair Processes
A. Dent repairs
B. Web repairs
C. Skin repairs
D. Spar repair
E. Rib repair

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 151 Structural Repair IV

Credit Hours: 4.00 **Lecture Periods:** 2.00 **Lab Periods:** 6.00

Description:

Continuation of AVM 150. Includes locking fasteners, damage classifications, and structural repair processes.

Prerequisite(s): AVM 150.

Course Learning Outcomes:

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

1. Describe the types, materials and sizing of special locking fasteners.
2. Demonstrate the use of locking fasteners in structural repair procedures.
3. Define and use damage classifications according to the Structural Repair Manual (SRM).
4. Use the SRM and the Illustrated Parts Catalog (IPC) to determine repair and replacement requirements.
5. Describe layout procedures and perform pressurized repair, flush skin and frame repair to heavy materials.

Outline:

I. Special Locking Fasteners
   - A. Types, Materials and Sizing
   - B. Installation Procedures for the following:
     1. Dzus
     2. Camlock
     3. Airlock
     4. Paneloc
     5. Zip-loc
     6. Milsou
     7. Calfac

II. Damage Classifications
   - A. Definitions
   - B. Allowable damage
   - C. Repairable damage
   - D. Replacement of the part
   - E. Damage beyond allowable limits
   - F. Hole preparation and stop drilling of cracks
   - G. Use of the SRM to identify type of damage

III. Repair and Replacement Requirements
   - A. Use of the SRM to determine repair procedures
   - B. Use of the IPC to determine parts replacement and effectiveness

IV. Repair Processes
   - A. Pressurized repairs
   - B. Flush skin repair - heavy material
   - C. Frame repair - heavy material
   - D. External patch repair

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 203 Structural Repair V

Credit Hours: 4.00 **Lecture Periods:** 2.00 **Lab Periods:** 6.00

Description:

Continuation AVM 151. Includes jigging, shoring and alignment, corrosion and heat treatment in structural repair processes.

Prerequisite(s): AVM 151.

Course Learning Outcomes:

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

1. Describe the procedures for jigging, shoring, leveling and aligning aircraft.
2. Describe safety and emergency safety procedures in the handling and use of corrosion treatment chemicals.
3. Demonstrate corrosion control of ferrous and non-ferrous aircraft structures.
4. Demonstrate corrosion control of plated aircraft parts.
5. Describe the principles and processes of heat treatment for aluminum structures and carton steel alloys.
6. Demonstrate the heat treatment of aluminum alloys.
7. Demonstrate layout and repair of aircraft control surfaces.
8. Demonstrate balancing of flight control surfaces.
9. Demonstrate use of reader and printer.

Outline:

I. Jigging, Shoring, and Alignment
   - A. Requirement
   - B. Shoring techniques
   - C. Jigging requirements
   - D. Alignment determination techniques
   - E. Jacking and leveling

II. Corrosion Treatment
   - A. Safety procedures
   - B. Emergency safety procedures
   - C. Corrosion damage and rework limits
   - D. Corrosion removal techniques
   - E. Identification of metals
   - F. Corrosion removal for aluminum alloys
   - G. Corrosion removal for magnesium
   - H. Corrosion removal for carbon steel
   - I. Corrosion removal for titanium alloys
   - J. Corrosion removal for chromium and nickel plated parts
   - K. Corrosion removal for cadmium plated parts

III. Heat Treatment
   - A. Basic principles of heat treatment for ferrous and non-ferrous metals
   - B. Equipment
   - C. Temperatures
   - D. Soaking
   - E. Quenching
   - F. Natural and artificial aging
   - G. Temper designations

H. Hardness
I. Strength specifications
J. Corrosion problems
K. Cracking
L. Quality assurance techniques
M. Heat treatment of aluminum alloys

IV. Structural Repair Processes
A. Layout and perform control surface repairs
B. Balance control surfaces
C. Stringer repairs
D. Frame repairs

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 204 Structural Repair VI

Credit Hours: 4.00 **Lecture Periods:** 2.00 **Lab Periods:** 6.00

Description:

Continuation of AVM 203. Includes sealants and sealant applications, heat treatment, plastics and plastic repairs and structural repair processes.

Prerequisite(s): AVM 203.

Course Learning Outcomes:

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

1. Describe aircraft sealant materials, use and safety.
2. Demonstrate sealant application.
3. Demonstrate heat treatment and tempering of alloy steels.
4. Demonstrate layout and repair of formed sections.
5. Demonstrate layout and repair of extruded sections.

Outline:

I. Sealants - General
   - A. Basic concept and definitions
   - B. Sealing materials
   - C. Types of sealant applications
   - D. Sealing equipment
   - E. Storage of sealant
   - F. Preparation of sealants
   - G. General safety precautions
   - H. Inspection requirements

II. Sealant Application
   - A. Sealant application technique
   - B. Sealing fuel tanks
   - C. Sealing structural repairs
   - D. Sealing pressure vessels
   - E. Specialized curing techniques

III. Heat Treatment
   - A. Basic heat treatment of alloy steels
   - B. Tempering for specific properties

IV. Structural Repair Processes
   - A. Formed section repair
   - B. Extruded section repair

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 205 Motion Dynamics

Credit Hours: 2.50 **Lecture Periods:** 1.25 **Lab Periods:** 3.75

Description:

Principles of hydraulic power. Includes basic physics, basic mechanics, heat and fluid dynamics, fabrication and installation of fluid lines and fittings, laws of motion, basic aerodynamics, and aircraft nomenclature.

Course Learning Outcomes:

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

1. Discuss principles related to physics, matter and energy. (Level 1)
2. Discuss principles of sound, heat and fluid dynamics. (Level 1)
3. Solve problems related to simple machines. (Level 2) Ref. Title 14 CFR Part 147, App. J, 3O.
4. Solve problems related to pressure, volume in fluid mechanics. (Level 2) Ref. Title 14 CFR Part 147, App. B. J, 30
5. Identify and demonstrate the proper materials and fittings for hydraulic system fluid lines. (Level 2). Ref. Title 14 CFR Part 147, App. B, D.13
6. Demonstrate proficiency in the fabrication of flexible hydraulic fluid lines. (Level 3) Ref. Title 14 CFR Part 147, App B, D, 13.
7. Demonstrate proficiency in the fabrication of rigid hydraulic fluid lines. (Level 3). Ref. Title 14 CFR Par 147, App. B D.13
8. Discuss principles related to aerodynamics, theory of flight. (Level 2). Ref Title 14 CFR Part 147, App B. J.30
9. Discuss airfoil characteristics and fundamentals of lift production. (Level 2) Ref. Title 14 CFR Part 147, App. B J. 30
10. Identify and describe basic components of an aircraft, differences in aircraft structures and airfoil design. (Level 2) Ref. Title 14 CFR Part 147, App. B J.30

Outline:

I. Basic Physics
   - A. Terms
   - B. Principles of physics
   - C. States of matter
   - D. Laws of motion
   - E. Potential energy
   - F. Kinetic energy

II. Simple Mechanics
   - A. Stresses
   - B. Leverage
   - C. Stored energy
   - D. Ratios

III. Sound, Heat, and Fluid Dynamics
   - A. Heat and energy
   - B. Heat transfer
   - C. Sound transmission
   - D. Temperature monitoring
   - E. Pressure types
   - F. Pressure monitoring

IV. Hydraulic Lines and Fittings
   - A. Rigid lines

- B. Flexible lines
- C. Standard fittings
- D. Military Standard (MS), Army, Navy Standard (AN), and Advisory Circular (AC) standards
- E. Tooling
- F. Fabrication methods

V. Basic Aerodynamics
- A. Forces of flight
- B. Physics of aerodynamics
- C. Airfoils
- D. Atmospheric conditions
- E. Center of pressure
- F. Supersonic flight
- G. Axis of an aircraft
- H. Stalls
- I. Control around the axis
- J. Speed, pitch, roll control

VI. Aircraft nomenclature
- A. Primary structure
- B. Primary flight controls
- C. Secondary flight controls
- D. Cockpit controls
- E. Cowlings and nacelles
- F. Skins and fairings
- G. Landing gear
- H. Panels and doors
- I. Wing types
- J. Empennage types
- K. Bundy layer control

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 211 Alternate Structures

Credit Hours: 4.00 **Lecture Periods:** 2.00 **Lab Periods:** 6.00

Description:

Aircraft structural fabrication using wood, tube steel and fabric processes and techniques. Includes structural types, wood and welded tube steel fabrication methods, welding of typical metals used in aircraft construction, fabric covering processes, inspection and maintenance typical repair procedures, and aircraft finishings.

Course Learning Outcomes:

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

1. Identify and discuss construction materials and methods used in wood aircraft construction. (Level 1)
2. Demonstrate proficiency in identification of wood defects and inspection techniques of wood structures. (Level 1) Ref. Title 14, Part 147, App. C, I, A. 2, 3
3. Demonstrate proficiency in servicing wood structural components and performing simple repairs to wood structure. (Level 1) Ref. Title 14 CFR, Part 147, App. C. IA1
4. Identify and discuss construction materials and methods used in tube steel aircraft construction. (Level 1)
5. Demonstrate proficiency in identification of tube steel defects and inspection techniques of welded structures. (Level 1)
6. Demonstrate proficiency in removal of damaged tube steel members and fabrication of replacement parts. (Level 1) Ref. Title 14 CFR, Part 147, App. C, I, E, 19
7. Discuss safety procedures for gas and arc welding. (Level 1)
8. Demonstrate proficiency in the selection and setup of oxyacetylene welding equipment for welding of tube steel. (Level 2)
9. Demonstrate proficiency in the selection and setup of equipment used in arc welding, soldering and brazing of steel. (Level 2)
10. Demonstrate to a novice level, gas and arc welding, soldering and brazing. (Level 2) Ref. Title 14, CFR, Part 147, App. C, I, E. 20
11. Discuss the procedures and precautions for welding of magnesium, titanium, aluminum, stainless steel and soldering of stainless steel. (Level 1) Ref. Title 14 CFR, Part 147, App. C, I, E. 17, 18, 21
12. Identify and discuss construction materials and methods used in fabric covering of aircraft structures. (Level 1)
13. Demonstrate proficiency in selecting and applying fabric and fiberglass covering materials. (Level 1) Ref. Title 14, CFR, Part 147, App. C, I, B, 4
14. Demonstrate proficiency in inspection, testing and repair of fabric and fiberglass. (Level 1) Ref. Title 14, CFR, Part 147, App. C, I, B. 5
15. Identify and select aircraft finishing materials. (Level 2) Ref. Title 14, CFR, Part 147, App. C, I, C. 7
16. Demonstrate proficiency in applying finish materials. (Level 2) Ref. Title 14, CFR, Part 147, App. C, I. C. 8
17. Demonstrate proficiency in inspection of finishes and identification of defects. (Level 2) Ref. Title 14, CFR, Part 147, App. C. I. C. 9
18. Demonstrate proficiency in applying trim, letters and touch-up paint. (Level 1) Ref. Title 14, CFR, Part 147 App. C, I, C. 6

Outline:

I. Wood Structures
   - A. Terms
   - B. Fuselage
   - C. Wing
   - D. Typical applications

II. Wood

- A. Types
- B. Defects
- C. Decay

III. Fastening
- A. Adhesives
- B. Metal fasteners

IV. Wood Machining
- A. Cutting
- B. Sanding
- C. Preparation for joining
- D. Installation of fasteners

V. Wood Repairs
- A. Identification of damage
- B. Inspection
- C. Replacement
- D. Scarf joints
- E. Splicing
- F. Patches

VI. Finishing Wood Structure
- A. Precautions
- B. Surface
- C. End grain
- D. Sealing holes

VII. Tubular Structures
- A. Terms
- B. Fuselage
- C. Landing gear
- D. Typical applications

VIII. Metals
- A. Types and alloys
- B. Harness indicators

IX. Machining
- A. Cutting
- B. Drilling
- C. Sanding/grinding
- D. Forming
- E. Fabrication of joints

X. Welding, Brazing, and Soldering
- A. Types of welding
- B. Brazing
- C. Soldering
- D. Equipment
- E. Gas welding
- F. F. Shielded metal arc (stick)
- G. Gas metal arc (MIA)
- H. Gas tungsten arc (TIA)

XI. Welded Repairs
- A. Joints
- B. Fit and preparation
- C. Selection of materials
- D. Precautions and safety
- E. Non-repairable structures

XII. Fabric Materials
- A. Terms
- B. Type of fabric
- C. Applications

XIII. Typical Installation
- A. Fastening materials

- B. Attachment to structure
- C. Shrinking
- D. Reinforcing
- E. Lacing
- F. Sewing
- G. Openings

XIV. Coatings
- A. Dopes
- B. Sealers
- C. Sanding
- D. Defects

XV. Repairs
- A. Precautions
- B. Sewn patch
- C. Doped on patch
- D. Refinishes

XVI. Finishes and Paints
- A. Paint types
- B. Thinning
- C. Catalyzing
- D. Cleanup
- E. Environmental
- F. Equipment

XVII. Finish Trims Striping
- A. Numbers and lettering
- B. Touchup
- C. Masking
- D. Decals

XVIII. Defects
- A. Orange peel
- B. Sags and runs
- C. Fisheye
- D. Scratches
- E. Scuffing

XIX. Repairs
- A. Inspection
- B. Sanding
- C. Matching
- D. Blending
- E. Polishing

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 218 Airframe Rigging and Landing Gear Systems

Credit Hours: 2.50 **Lecture Periods:** 1.25 **Lab Periods:** 3.75

Description:

Identification, assembly, alignment, balancing and rigging of aircraft rigging and landing gear systems. Includes aircraft nomenclature, characteristics of flight, flight control system, airframe assembly, rigging, structural alignments, control surface balancing, landing gear, shock struts, landing gear retraction, wheel alignment and steering, brake system servicing, brake assemblies, wheels, tires, warning systems, and anti-skid system.

Course Learning Outcomes:

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

1. Describe flight characteristics about the three axis of flight and the performance issues affected by rigging. (Level 1)
2. Identify and describe critical elements of rotary wing aircraft rigging. (Level 1). Ref. Title 14 CFR Part 147, App C, I, F. 22)
3. Perform assembly of aircraft structural components and flight control surfaces. (Level 3) Ref. Title 14 CFR Part 147, App C, I, F.25
4. Perform rigging and alignment checks of fix wing aircraft structures. (Level 2) Ref. Title 14 CFR Part 147, App. C, I. F. 23,24
5. Perform balancing and rigging of primary and secondary flight control surfaces (Level 3) Ref. Title 14, CFR Part 147, App C, I, F.26
6. Perform jacking and leveling of aircraft for rigging checks. (Level 3) Ref. Title 14 CFR Part 147, App C, F.27)
7. Identify various landing gear configurations and describe advantages and disadvantages of each. (Level 1)
8. Describe the safety precautions of maintenance around the landing gear systems. (Level 1)
9. Identify and describe landing gear system components for purpose and operations. (Level 1)
10. Perform retraction, braking and steering system operation checks, servicing, maintenance, and inspections. (Level 3) Ref. Title 14 CFR Part 147, App. C, II, A 29
11. Describe the operation of remote position indicating and configuration warning systems. (Level 1)
12. Perform inspections, checks and servicing of speed and configuration warning systems, electrical brake controls and anti-skid systems. (Level 2) Ref. Title 14 CFR Part 147, App. C, II, H 51
13. Perform Inspections, checks, troubleshooting and servicing of landing gear position indicating and warning systems. (Level 3) Ref. Title 14 CFR Part 147, App. C, II, H, 52

Outline:

I. Aircraft Nomenclature
   - A. Fuselage types
   - B. Wing types
   - C. Empennage types
   - D. Flight controls
     1. Primary
     2. Secondary
   - E. Landing gear types

II. Characteristics of Flight
   - A. Flight about the axis
   - B. Lift vs. drag
   - C. Stability
     1. static
     2. Dynamic

3. Longitudinal
4. Directional
5. Lateral

D. Thrusts
E. Torque

III. Flight Control System
A. Flight controls
1. Primary
2. Secondary

B. Mechanical linkage
C. Hydraulic/mechanical
D. Artificial feedback
E. Control locks (external)

IV. Airframe Assembly
A. Technical data
B. Special tooling
C. Jigs and fixtures

V. Rigging
A. Positioning
B. Surface travel
C. Cable tensioning
D. Rig pin and locks
E. Fixtures and templates

VI. Structural Alignments
A. Symmetry checks
B. Alignment
C. Dihedral
D. Incidence
E. Instruments (measurement)

VII. Control Surface Balancing
A. Principles
B. Rebalancing
C. Static balance
D. Dynamic balance
E. Tools and fixtures

VIII. Landing Gear, and Shock Struts
A. Nomenclature
B. Principles of operation
C. Servicing and maintenance

IX. Landing Gear Retraction
A. Support structure
B. Nomenclature
C. Electrical actuation
D. Hydraulic actuation
E. Manual actuation
F. Emergency extension
G. Positions indicating
H. Rigging/adjustment
I. Maintenance
J. Inspection

X. Wheel alignment/steering
A. Torque links
B. Centering cams
C. Hose wheel steering
D. Shimmy dampers

XI. Brake system servicing
A. Maintenance
B. Servicing

- C. Inspection

XII. Brake assemblies
- A. Single disc
- B. Multiple disc
- C. Segmented rotor
- D. Expander tube

XIII. Brake system servicing
- A. Maintenance
- B. Servicing
- C. Inspection

XIV. Wheels
- A. Split
- B. Flange
  1. Fixed
  2. Removable
- C. Bearings
- D. Axle

XV. Tires
- A. Construction
- B. Nomenclature
- C. Inflation issues
- D. Inspection

XVI. Warning systems
- A. Gear warning systems
  1. Flap
  2. Throttle
- B. Stall warning
- C. Position indication
- D. Maintenance
- E. Inspection

XVII. Anti-skid system
- A. System principles
- B. Airspeed vs. wheel speed
- C. Components
- D. Protection systems

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 223 Hydraulic and Pneumatic Power

Credit Hours: 2.50 **Lecture Periods:** 1.25 **Lab Periods:** 3.75

Description:

Hydraulic and pneumatic system components. Includes system operating principles, fluids, pressures, hydraulic powered flight controls, landing gear, braking and accessory power systems, pneumatically powered or assisted accessories, and system and component inspection servicing and repairs.

Course Learning Outcomes:

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

1. Demonstrate a working knowledge of the principles of hydraulic and pneumatic power systems. (Level 1)
2. Describe the system requirements for small and large aircraft by comparison of their needs. (Level 1)
3. Identify and discuss hydraulic and pneumatic system components both physically and operationally. (Level 2)
4. Identify and select hydraulic fluids and match them with their proper seal, line and "O" ring materials. (Level 3) Ref. Title 14 CFR Part 147, App. C, II, B. 31
5. Describe the function and construction of hydraulic and pneumatic power pumps. (Level 1)
6. Describe the function and construction of hydraulic and pneumatic selector valves. (Level 1)
7. Demonstrate the repair and servicing of hydraulic actuators, master cylinders and simple pumps.
8. Demonstrate the repair and servicing of pneumatic power systems components. (Level 2) Ref. Title 14 CFR Part 147, App. C, II, B. 30
9. Inspect, check, troubleshoot, service and repair of aircraft hydraulic brake systems. (Level 3) Ref: Title 14 CFR Part 147, App. C, II, B. 32
10. Inspect, check, troubleshoot, service and repair of aircraft hydraulic landing gear retraction and extension systems. Level 3) Ref. Title 14 CFR Part 147, App. C, II, B. 32
11. Inspect, check, service, troubleshoot and repair of pneumatic power system components. (Level 3) Ref. Title 14 CFR Part 147, App. C, II, B. 32
12. Demonstrate servicing of hydraulic reservoirs, filters. (Level 3) Ref. Title 14 CFR Part 147, App. C, II, B. 32
13. Demonstrate the removal and installation of hydraulic components to include purging of trapped air. (Level 3) Ref. Title 14 CFR Part 147, App. C, II, B. 32

Outline:

I. Hydraulic Fluids
   - A. Viscosity
   - B. Stability
   - C. Types
   - D. Precautions

II. System Principles
   - A. Needs for power
   - B. Moving of fluid
   - C. Routing and selector valves
   - D. Basic components

III. Reservoirs Types
   - A. Features
   - B. Servicing and inspection

IV. Filters
   - A. Types
   - B. Features
   - C. Servicing and inspection

V. Fluid Pumps
   A. Hand pumps
   B. Constant delivery
   C. Variable delivery
   D. Types
   E. Features
   F. Servicing and inspection
VI. Pressure Regulation
   A. Relief valves
   B. Regulators
   C. Indicating equipment
   D. Adjustment and servicing
VII. Accumulators
   A. Types
   B. Features
   C. Servicing
VIII. Check Values
   A. Types
   B. Features
   C. Installations
IX. Actuating Cylinders
   A. Types
   B. Principles of operation
   C. Inspection and servicing
   D. Maintenance
X. Selector Valves
   A. Operating principles
   B. Types
   C. Applications
XI. Hydraulic Power Systems
   A. Light A/C brakes
   B. Heavy A/C brakes
   C. Flight controls
   D. Steering
   E. Accessories
XII. Pneumatic Power Supply
   A. Pumps and supply
   B. Storage
   C. Precautions
XIII. Pneumatic Power Equipment
   A. Control valves
   B. Pressure adjustment
   C. Restrictors
   D. Filters
   E. Maintenance and inspection

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 226 Engine Electrical

Credit Hours: 4.00 **Lecture Periods:** 2.00 **Lab Periods:** 6.00

Description:

Inspection, repair, and modification of engine electrical systems. Includes magneto(s) (components, tooling, wiring, and drives), ignition switches, ignition harness, ignition booster system, spark plugs, engine ignition analyzers, turbine engine (ignition transformers and igniter plugs), engine electrical controls (switches, fuses and circuit breaker, circuits, wiring, installation, and engine bulkhead), and technical data manuals and catalogs.

Prerequisite(s): AVM 208.

Course Learning Outcomes:

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

1. Demonstrate proficiency in defining and discussing the electrical and mechanical operation of both magneto and battery ignition systems. (Level 1)
2. Describe the types of induction associated with basic magneto operation. (Level 1)
3. Demonstrate the safe and proper operation of test equipment used during magneto overhaul. (Level 2) Ref. Title 14 CFR Part 147, App. D, Section II, E. 17, 18
4. List the characteristics of primary and secondary electrical circuits of a magneto. (Level 1)
5. Disassemble, inspect, troubleshoot, repair, reassemble, service and test a magneto (Level 2) Ref. Title 14 CFR Part 147, App. D, Section II, E. 18
6. Discuss the construction and operation of spark plugs and ignition harnesses. (Level 1)
7. Remove, inspect, service, clean and reinstall spark plugs. (Level 2) Ref. Title 14 CFR Part 147, App. D, Section II, E. 18
8. Discuss various troubleshooting techniques or practices used on ignition harnesses. (Level 1)
9. Inspect, service, overhaul or repair ignition harnesses. (Level 3) Ref. Title 14 CFR Part 147, App. D, Section II, E. 17
10. Demonstrate the installation and timing of magnetos to an engine. (Level 2) Ref. Title 14 CFR Part 147, App. D, Section II, E. 18
11. Discuss the electro/mechanical needs of turbine engine ignition systems and components. (Level 1)
12. Inspect, service, troubleshoot and repair turbine engine electrical starting and ignition systems components. (Level 3) Ref. Title 14 CFR Part 147, App. D, Section II, E. 18. 9a
13. Inspect, service and troubleshoot turbine engine pneumatic starting systems. (Level 1) Ref. Title 14 CFR Part 147, App. D, Section II, E. 19b
14. Test a turbine engine ignition lead. (Level 3) Ref. Title 14 CFR, Appendix D, Section II, E. 18
15. Remove, clean, inspect and install a turbine engine ignition plug. (Level 2) Ref. Title 14 CFR Part 147, App. D. Section II, E. 18
16. Demonstrate proficiency in discussion of engine electrical controls and switches. (Level 1).
17. Describe the types of circuitry, wiring methods and circuit protection used to operate engine electrical systems. (Level 1)
18. Repair selected engine electrical system components. (Level 2) Ref. Title 14 CFR Part 147, App. D, Section II, C. 12
19. Install, check and service engine electrical wiring, controls, switches, indicators and protective devices. (Level 3) Ref. Title 14 CFR Part 147, App. D, Section II, C. 13

Outline:

I. Magnetos (Components)
   - A. Rotor
   - B. Magnets

- C. Bearings
- D. Pole shoe
- E. Housings
- F. Timing gears
- G. Coils
- H. Breaker points
- I. Distributor

II. Magnetos (Tooling)
- A. Basic tools for disassembly
- B. Point gapping tools
- C. E-gap equipment
- D. Fixtures
- E. Timing equipment
- F. Condenser testers
- G. Magneto test bench
- H. Ohm meter ops

III. Magnetos (Wiring)
- A. High tension
- B. Low tension
- C. Flexible shielding
- D. Non-flexible shielding
- E. Ignition contacts

IV. Magnetos (Drives)
- A. Impulse
  1. Operation
  2. Lag
  3. Inspection
- B. Direct drive spline
- C. Accessory drive attachments

V. Ignition Switches
- A. Purpose
- B. Types
- C. Operation
- D. Installations

VI. Ignition Harness
- A. Descriptions
- B. Types
- C. Operations
- D. Installations
- E. Troubleshooting
- F. Repairs

VII. Ignition Booster System
- A. Description of operation
- B. Booster coil
- C. Induction vibrator
- D. Troubleshooting

VIII. Spark Plugs
- A. Description of operation
- B. Types and designations
- C. Reach
- D. Electrodes
- E. Servicing

IX. Engine Ignition analyzers
- A. Description of operations
- B. Equipment types
- C. Usage

X. Turbine Engine (Ignition Transformers)
- A. Description of operations

- B. Types and designations
- C. Hazards
- D. Components
- E. Mounting
- F. Troubleshooting and repair

XI. Turbine Engine (Igniter Plugs)
- A. Description of operation
- B. Types/designations
- C. Hazards
- D. Components
- E. Igniter leads
- F. Troubleshooting, servicing and repair

XII. Engine electrical controls (switches)
- A. Types
- B. Applications
- C. Troubleshooting and repair
- D. Installations

XIII. Engine electrical controls (fuses, circuit breakers)
- A. Types
- B. Applications
- C. Troubleshooting and repair
- D. Installations

XIV. Engine Electrical Controls (Circuits)
- A. Type
- B. Power supplies
  1. 14 volt
  2. 28 volt
  3. 115 volt AC
- C. Applications
- D. Troubleshooting and repair

XV. Engine Electrical Controls (wiring)
- A. Types
- B. Applications
- C. Sizing
- D. Selection
- E. Installation
  1. Securing
  2. Protective methods
  3. Typical installations

XVI. Engine Electrical Controls (Installation)
- A. Electrical terminals
- B. Splicing
- C. Bonding jumpers
- D. Identification of cables

XVII. Engine Electrical Controls (Engine Bulkhead)
- A. Connector plugs
- B. Mating receptacles
- C. Quick disconnect
- D. Securing and safe tying

XVIII. Technical Data
- A. Service manuals (SM)
- B. Part catalogues
- C. Maintenance manuals (MM)
- D. Wiring diagram manuals (WDM)
- E. Overhaul manuals (OM)

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 227 Engine Air Flow Systems

Credit Hours: 2.50 **Lecture Periods:** 1.25 **Lab Periods:** 3.75

Description:

Fundamentals of engine air flow systems. Includes reciprocating engine induction systems, alternate induction air systems, induction systems maintenance, superchargers, turbochargers, turbo compound systems, reciprocating engine exhaust systems, exhaust subsystems, exhaust system maintenance, reciprocating engine cooling, turbine engine induction systems, turbine engine cooling, turbine engine exhaust systems, turbine engine exhaust systems maintenance, and turbine engine airflow subsystems.

Course Learning Outcomes:

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

1. Demonstrate proficiency in correctly identifying reciprocating, induction, exhaust and cooling systems, components and be able to discuss their operating characteristics. (Level 1)
2. Demonstrate knowledge of how superchargers and turbo chargers function and enhance the performance of reciprocating engines and how these units are controlled and monitored. (Level 1)
3. Demonstrate knowledge of reciprocating engine exhaust systems, components, functions and how they affect other related airframe systems. (Level 1)
4. Perform inspection, check and servicing of a carbureted air intake and induction manifold system on an aircraft. (Level 3) Ref. Title 14 CFR Part 147, Appendix D, Section II, H, 28.
5. Perform carburetor intake and induction system repairs. (Level 3) Ref. Title 14 CFR Part 147, Appendix D, Section II, H, 28.
6. Perform engine exhaust system component repairs. (Level 2) Ref. Title 14 CFR Part 147, Appendix D, Section II, J, 31.
7. Demonstrate proficiency in inspection, check, troubleshoot, service and repair of engine exhaust systems. (Level 3) Ref. Title 14 CFR Part 147, Appendix D, Section II, J. 32a.
8. Perform repairs to engine cooling system components. (Level 2) Ref. Title 14 CFR Part 147, Appendix D, Section II, I, 29.
9. Demonstrate proficiency in inspection, check, troubleshoot, service and repair of engine cooling systems. (Level 3) Ref. Title 14 CFR Part 147, Appendix D, Section II, H, 27.
10. Perform inspections, check, servicing, troubleshooting and repairs to heat exchangers. (Level 1) Ref. Title 14 CFR Part 147, Appendix D, Section II, H, 27.
11. Perform inspection, check service and repair to superchargers. (Level 1) Ref. Title 14 CFR Part 147, Appendix D, Section II, H, 27.
12. Demonstrate proficiency in inspection, check service and repair of reciprocating engine ice and rain control systems. (Level 2) Ref. Title 14 CFR Part 147, Appendix D, Section II, H, 26.
13. Demonstrate a working knowledge of turbine engine induction systems to include nomenclature and principles of operation of the inlet and its associated sub-systems. (Level 1)
14. Perform inspections, checks and servicing of turbine engine inlet and cowlings. (Level 2)
15. Demonstrate knowledge of turbine engine cooling sub system enclosed inside engine cowling and perform typical inspections associated with the turbine engines accessories. (Level 2)
16. Demonstrate proficiency in inspection, check, service and repair of turbine engine ice and rain control systems. (Level 2) Ref. Title 14 CFR Part 147, Appendix D, Section II, H, 26.
17. Demonstrate proficiency in performing troubleshooting service and repair to turbine engine thrust reverser system and components. (Level 1) Ref. Title 14 CFR Part 147, Appendix D, Section II, J. 32b.
18. Demonstrate proficiency in performing inspections, checks, servicing of reciprocating engine turbocharger systems. (Level 1)

Outline:

I. Reciprocating Engine Induction Systems
   A. Naturally aspirated
      1. Air scoop
      2. Air filters
      3. Ducting
      4. Manifolds
   B. Super charged
      1. Air scoop
      2. Filters
      3. Ducting
      4. Manifolds

II. Alternate Induction Air Systems
   A. Air preheat
   B. Carburetor ice
   C. Induction air heat exchange
   D. Induction air icing
      1. Alternate air source
      2. Cabin heating
      3. Water separation

III. Induction System Maintenance
   A. Inspections
   B. Repairs
   C. Servicing

IV. Superchargers
   A. Principles of operation
   B. Internally driven
   C. Externally driven
   D. Inspection and maintenance

V. Turbochargers
   A. Principles of operation
   B. Components
   C. Intercoolers and heat exchanges
   D. Waste gate
   E. Controllers
   F. Fuel system requirements
   G. Lubrication
   H. Inspection and maintenance

VI. Turbo Compound Systems
   A. Principles of operation
   B. Components
   C. Applications

VII. Reciprocating Engine Exhausts Systems
   A. Principles of operation
   B. Materials
   C. Types
      1. Open systems
      2. Collector
   D. Effect on power production

VIII. Exhaust Subsystems
   A. Ejectors
   B. Expansion joints
   C. Augmenters
   D. Heating source
   E. Mufflers
   F. Thermal anti ice

IX. Exhaust System Maintenance

- A. Hazards
  - 1. Crew and passengers
  - 2. Aircraft components
- B. Inspection
- C. Service and maintenance
- D. Repairs

X. Reciprocating Engine Cooling
- A. System functions
- B. Principles of operation
- C. Cowlings
  - 1. Construction
  - 2. Installation and removal
- D. Baffling and seals
  - 1. Cylinder fin cooling
  - 2. Accessory cooling
  - 3. Exhaust component cooling
- E. Inspection and maintenance

XI. Turbine Engine Induction Systems
- A. Air inlets principles of operation
  - 1. Subsonic inlet ducts
  - 2. Supersonic inlet ducts
- B. Divergent type
- C. Convergent type
- D. Blow-in doors

XII. Turbine Engine Cooling
- A. Distribution of inlet air
- B. Fan and by-pass air
- C. Combustor air cooling
- D. Air mixers

XIII. Turbine Engine Exhaust Systems
- A. Flow of gasses
- B. Collection of gasses
  - 1. Divergent passages
  - 2. Convergent ducts
  - 3. Inner cone
- C. Insulation of components

XIV. Turbine Engine Exhaust Systems Maintenance
- A. Typical operational problems
- B. Inspection
- C. Service and maintenance
- D. Repair

XV. Turbine Engine Airflow Subsystems
- A. Cowl and glide vane anti-ice control
- B. Vortex destruction
- C. Thrust reverse
  - 1. Clamshell (external blocking)
  - 2. Cascade vane (internal blocking)

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 228 Aircraft Propellers

Credit Hours: 2.50 **Lecture Periods:** 1.25 **Lab Periods:** 3.75

Description:

Basics of aircraft propellers. Includes propeller theory, nomenclature, types, construction, and installation and maintenance. Also includes constant speed systems, feathering systems, reversing systems, icing systems, synchronizing systems, and unducted fans.

Course Learning Outcomes:

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

1. Demonstrate proficiency in correctly identifying propeller components and the typical nomenclature used in inspection checks, servicing, and repairs. (Level 1)
2. Perform balancing of propellers (Level 1) Ref. Title 14 CFR Part 147, App. D, Section II, K. 35
3. Demonstrate removal and installation of fixed and controllable pitch propellers. (Level 3) Ref. Title 14 CRF Part 147, App. D, Section II, K. 38
4. Perform inspection checks, service, and repair of fixed pitch propellers. (Level 3) Ref. Title 14 CFR Part 147, App. D, Section I, K. 37
5. Perform troubleshooting of propeller and propeller systems. (Level 3) Ref. Title 14 CFR Part 147, App. D, section II, K. 38
6. Perform inspection checks, service, and repair of constant speed and feathering propellers and propeller governing systems. (Level 3) Ref. Title 14 CFR Part 147, App. D, section I, K. 37
7. Demonstrate proficiency in the repair of propeller control system components (Level 3) Ref. Title 14 CFR Part 147, Appendix D, Section II, K. 36
8. Demonstrate proficiency in the repair of aluminum alloy propeller blades. (Level 3) Ref. Title 14 CFR Part 147, App. D, Section II, K. 39
9. Demonstrate proficiency in the identification and selection of propeller lubricants. (Level 2) Ref. Title 14 CFR Part 147, App. D, Section II, K. 34
10. Perform inspection checks, service, and repair of propeller, synchronizing, and ice control systems. (Level I) Ref. Title 14 CFR Part 147, App. D, Section II, K. 33
11. Demonstrate proficiency in inspecting and troubleshooting unducted fan systems and components. (Level 1) Ref. Title 14 CFR Part 147, App. D, Section II, L. 40

Outline:

I. Propeller Theory
   - A. Production of thrust
   - B. Forces acting on propellers
     1. Centrifugal
     2. Torque bending force
     3. Thrust bending force
     4. Aerodynamic twisting force
     5. Centrifugal twisting force

II. Propeller Nomenclature
   - A. Leading edge
   - B. Trailing edge
   - C. Tip
   - D. Shank
   - E. Blade face
   - F. Blade back
   - G. Chord line

- H. Blade angle
- I. Axis of rotation
- J. Blade pitch and distribution

III. Types of Propellers
- A. Fixed pitch
- B. Ground adjustable
- C. Two position
- D. Controllable pitch
- E. Identification
  1. McCauley
  2. Sensenich
- F. Constant speed
- G. Feathering

IV. Propeller Construction
- A. Wood propellers
- B. Aluminum propellers
- C. Steel propellers
- D. Composite propellers

V. Propeller Installation and balancing
- A. Tapered shaft
- B. Flanged shaft
- C. Splined shaft
- D. Propeller safetying
- E. Propeller blade tracking
- F. Propeller balancing

VI. Propeller Maintenance
- A. Inspections and checks
- B. Service
- C. Repairs
- D. Lubricants and lubrication
- E. Propeller Federal Aviation Regulations (FARs)
- F. Propeller repair stations

VII. Constant Speed Systems
- A. Theory
- B. Types
- C. Instrumentation
- D. Controls
- E. Governors
- F. System operation
- G. Installation and removal
- H. Inspections and checks
- I. Troubleshooting
- J. Service and repairs

VIII. Feathering Systems
- A. Theory
- B. Types
- C. Controls
- D. System operation
  1. Instrumentation
  2. Accumulator
  3. Governors
- E. Installations
- F. Inspections and checks
- G. Troubleshooting
- H. Service and repair

IX. Reversing Systems
- A. Theory
- B. Types

- C. Controls
- D. System operation
  1. Instrumentation
  2. Precautions
- E. Installations
- F. Inspections and checks
- G. Troubleshooting
- H. Service and repair

X. Propeller Icing Systems
- A. Theory
- B. Types
- C. Controls
- D. System operation
- E. Installations
- F. Inspections and checks
- G. Troubleshooting
- H. Service and repair

XI. Propeller Synchronizing Systems
- A. Theory
- B. Types
- C. Instruments
- D. Controls
- E. Special sub systems
- F. System operations
- G. Installation removal
- H. Inspections and checks
- I. Troubleshooting
- J. Service and repair

XII. Unducted Fans
- A. Theory
- B. Types
- C. System operations
- D. Systems components
- E. Installations
- F. Inspections and checks
- G. Troubleshooting
- H. Service and repairs

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 229 Engine Support Systems

Credit Hours: 2.50 **Lecture Periods:** 1.25 **Lab Periods:** 3.75

Description:

Theory and application of support systems for gas turbine engines. Includes fire protection, fire detection systems, fire extinguishing agents and systems, and fire detection and extinguishing system maintenance. Also includes turbine engine pneumatic systems, pneumatic starting systems, thrust reversers, auxiliary power units, turbine engine removal and installation, and engine storage and transport.

Course Learning Outcomes:

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

1. Demonstrate proficiency in performing inspection checks and servicing of engine fire detection and extinguishing systems. (Level 3) Ref. Title 14, CFR, Part 147 App. D, Section II, B, 11.
2. Perform troubleshooting and repairs of engine fire detection and extinguishing systems. (Level 3) Ref. Title 14, CFR, Part 147 App. D, Section II, B, 11.
3. Demonstrate a working knowledge of aircraft pneumatic system operations powered by engine and auxiliary power unit (APU) bleed air. (Level 2)
4. Perform inspection checks and servicing on turbine engine pneumatic starting systems. (Level 1) Ref. Title 14, CFR, Part 147 App. D, Section II, E, 19b.
5. Perform troubleshooting and repairs to turbine engine pneumatic starting systems. (Level 1)Ref. Title 14, CFR, Part 147 App. D, Section II, E, 19b
6. Demonstrate inspection checks, troubleshooting, and repairs to engine thrust reverser systems and components. (Level 1) Ref. Title 14, CFR, Part 147 App. D, Section II, J, 32b.
7. Demonstrate proficiency in pre-operation inspections and operation of auxiliary power units and related electrical and fire protections. (Level 3)
8. Perform inspection checks, servicing, and troubleshooting of turbine driven auxiliary power units. (Level 1) Ref. Title 14, CFR, Part 147 App. D, Section II, M, 41.
9. Demonstrate proficiency in inspection checks, servicing, and repair of turbine engine installations. (Level 3) Ref. Title 14, CFR, Part 147 App. D, Section II, B, 6.
10. Install, troubleshoot, and remove a turbine engine. (Level 3) Ref. Title 14, CFR, Part 147 App. D, Section II, B, 7.

Outline:

1. Fire Protection
   - A. Requirements
   - B. Fire detection
   - C. Fire extinguishing
   - D. Fire zones
2. Fire Detection Systems
   - A. Thermal switch
   - B. Thermocouple
   - C. Continuous loop
   - D. Spot detector
   - E. Rate of temperature rise
   - F. Radiation sensing
   - G. Smoke detection
   - H. Overheat detectors
   - I. Carbon monoxide detectors
   - J. Combustible mixture

K. Fiber optic detector
L. Observations by crew

3. Fire Extinguishing Agents
   A. Carbon dioxide
   B. Halogenated hydrocarbons
   C. Health and environmental precautions
   D. Fire Protection Systems
      1. Single point extinguishers
      2. Multiple point extinguishers
      3. High rate discharge systems
4. Fire Detection and Extinguishing System Maintenance
   A. Inspections and checks
   B. Troubleshooting
   C. Servicing
   D. Repairs
5. Turbine Engine Pneumatic Systems
   A. Bleed air sources
   B. Air to air heat exchangers
   C. Controls and monitoring
   D. Valves, lines and fittings
   E. Inspections/checks and servicing
6. Pneumatic Starting Systems
   A. Starters
   B. Controls and operation
   C. Installations
   D. Maintenance
   E. Troubleshooting and repair
7. Auxiliary Power Units
   A. Theory of operation
   B. Installations
   C. Controls and operations
   D. Starting system
   E. Fuel control system
   F. Speed sensing
   G. Power production
   H. Induction and exhausts
   I. Engine components
   J. Fire protection
   K. Inspection and checks
   L. Servicing
   M. Troubleshooting and repairs
8. Thrust Reversers
   A. Operation and controls
   B. Installations
   C. Types
      1. Internal blockage
      2. External blockage
   D. Deflector valves
   E. System components
   F. Inspection/checks
   G. Service and repairs
   H. Troubleshooting
9. Turbine Engine Removal
   A. Specialty equipment
      1. Hoists
      2. Transport dollies
   B. Engine mounts
   C. Attaching hardware

D. Electrical disconnects
E. Control disconnects
F. Fuel lines attachments
G. Pneumatic lines attachments
H. Check list usage

10. Turbine Engine Installation
    A. Pre-installation checks
    B. Mounting and attachment
    C. System connections
    D. Rigging of controls
    E. Inspections and checks
11. Engine Storage and Transport
    A. Preserving processes
    B. Securing for shipping
    C. Shipping equipment

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 232 Reciprocating Engine Overhaul

Credit Hours: 4.00 **Lecture Periods:** 2.00 **Lab Periods:** 6.00

Description:

Basic aircraft reciprocating engine overhaul. Includes engine components, wrist pins, connection rods, crankshafts, case, cam shafts, lifters, valves, push rods and tubes, rocker assemblies, accessories, lubrication, overhaul options overhaul credentials, overhaul procedures, reassembly after overhaul, engine installations, engine break-in, and test cell procedures.

Course Learning Outcomes:

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

1. Demonstrate proficiency in correctly identifying engine components and the use of typical powerplant nomenclature. (Level 1)
2. Identify, select and compare typical cylinder head markings and match them with their proper ring types. (Level 1)
3. Demonstrate proficiency in the description of operation, identification and mechanics of value train systems for opposed and radial engines. (Level 1) Ref. Title 14, CFR, Part 147, App. D, Section I, A, 1.
4. Demonstrate proficiency in performing visual, dimensional and non-destructive inspections used in reciprocating engine overhaul. (Level 3) Ref. Title 14, CFR, Part 147, App. D, Section I, A, 2, 3.
5. Correctly identify numbering of cylinder, rotation of cam and accessory gears. (Level 1)
6. Demonstrate proficiency in the correct use of test equipment and fixtures used during engine overhaul. (Level 3) Ref. Title 14, CFR, Part 147, App. D, Section I, A, 2, 3.
7. Demonstrate proficiency in the proper methods of cleaning engine component in preparation for inspection, repair or overhaul. (Level 2) Ref. Title 14, CFR, Part 147, App. D, Section I, 2.
8. Demonstrate proficiency in cylinder overhaul techniques and procedures. (Level 3) Ref. Title 14, CFR, Part 147, App. D, Section 1, 3.
9. Demonstrate proficiency in the removal and installation techniques used for aircraft power plants. (Level 3) Ref. Title 14, CFR, Part 147, App. D, Section I, A, 3, 4.
10. Demonstrate proficiency in the inspection, check troubleshoot and repair of aircraft engine installations. (Level 3) Ref. Title 14, CFR, Part 147, App. D, Section I, A, 3, 4.
11. Demonstrate proficiency in inspection, check servicing and repairs of engine accessories and instrumentation for engine operations. (Level 3) Ref. Title 14, CFR, Part 147, App. D, Section I, A, 3.

Outline:

I. Engine Components: Cylinders and Heads
   - A. Barrels
   - B. Skirts
   - C. Fins
   - D. Materials
   - E. Taper
   - F. Mounting holes

II. Pistons
   - A. Materials
   - B. Shapes
   - C. Ring groves
   - D. Ring types
   - E. Cam ground

III. Wrist Pins
   - A. Materials

- B. Caps and retainers

IV. Connection Rods
- A. Materials
- B. Bushing and bearings
- C. Lubrication

V. Crankshafts
- A. Materials
- B. Manufacturing process
- C. Rod and bearing journals
- D. Throws
- E. Counter weights
- F. Flange and spline prop shafts

VI. Case
- A. Materials
- B. Construction
- C. Stud and bolts
- D. Alignment
- E. Lubrication
- F. Data plates
- G. Assembly concerns

VII. Cam Shafts
- A. Materials
- B. Manufacturing process
- C. Bearing journals
- D. Cam lobes

VIII. Lifters
- A. Solid
- B. Hydraulic
- C. Lubrication

IX. Valves
- A. Types
- B. Materials
- C. Nomenclature
- D. Grinding
- E. Lapping
- F. Seats
- G. Guides

X. Push Rods and Tubes
- A. Types
- B. Materials
- C. Lubrication

XI. Rocker Assemblies
- A. Types
- B. Materials
- C. Lubrication

XII. Accessories
- A. Gears
- B. Case
- C. Mounting pads

XIII. Lubrication
- A. Principles
- B. Lubricants
- C. Oil pumps
- D. Filters
- E. Sumps
- F. Oil supplies

XIV. Overhaul Options
- A. Complete

- B. Top overhaul
- C. Remanufacture
- D. Factory service instructions
- E. When to overhaul

XV. Overhaul Credentials
- A. Who is authorized
- B. A&P
- C. A&P – I/A
- D. Factory
- E. Repair station

XVI. Overhaul Procedures
- A. Initial inspections
- B. Disassembly
- C. Cleaning
- D. Dimensional inspections/table of limits
- E. NDI inspections
- F. Magnetic particles
- G. Dye penetrate
- H. Eddy current
- I. X-ray
- J. Manuals
- K. Service instructions
- L. Individual component maintenance
- M. Crankshaft and camshaft run out
- N. Valve and cylinder grinding
- O. Spring, rod, lifter, and rocker inspection and service

XVII. Reassembly After Overhaul
- A. Layout of components
- B. Tooling and equipment

XVIII. Torque
- A. Pre-lubrication
- B. Paperwork

XIX. Engine Installations
- A. Motor mount
- B. Accessories
- C. Magnetos, plugs, and harnesses
- D. Starter
- E. Fuel systems
- F. Electrical
- G. Propeller
- H. Baffling

XX. Engine Break-In
- A. Procedures
- B. Cooling
- C. Monitoring
- D. Instrumentation
- E. Run cells
- F. Aircraft installations

XXI. Test Cell Procedures
- A. Minimum crew
- B. Equipment limitations
- C. Safety concerns

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

AVM 233 Turbine Engines

Credit Hours: 4.00 **Lecture Periods:** 2.00 **Lab Periods:** 6.00

Description:

Basic gas turbine engine and turbo propeller component makeup and repair. Includes inspection, servicing, and repairs performed on engine components: compressor, diffuser, combustion, accessory drive, and lubricating system. Also includes a reassembly overhaul.

Course Learning Outcomes:

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

1. Demonstrate proficiency in correctly identifying engine components and the use of typical powerplant nomenclature. (Level 1)
2. Demonstrate proficiency in the description, operation, mechanics and principles of gas turbine engines. (Level 1)
3. Perform disassembly and removal of gas turbine engine section components to allow access for inspection, check, service and repair of turbine engine components. (Level 2)
4. Perform inspection, check servicing and repair of turbine engines. (Level 3). Ref. Title 14, CFR Part 147, App. D. Section I, B. 6.
5. Perform overhaul of a turbine engine. (Level 2) Ref. Title 14, CFR Part 147, App. D. Section I, B. 5.
6. Demonstrate proficiency in identifying and selection of lubricants. (Level 2) Ref. Title 14, CFR Part 147, App. D. Section II, D, 14.
7. Perform repairs to engine lubrication system components. (Level 2) Ref. Title 14, CFR Part 147, App. D. Section II, D, 15.
8. Demonstrate proficiency in performing inspections, checks, service, troubleshooting and repairs to engine lubrication systems. (Level 3) Ref. Title 14, CFR Part 147, App. D. Section II, D, 16.
9. Perform reassembly and securing of components after inspections, checks, servicing, repairs made during overhaul. (Level 2)
10. Perform final overhaul inspection and sign off of maintenance performed. (Level 2)

Outline:

I. Engine Components: Compressor
   - A. Principles of operation
     1. Pressure
     2. Velocity
     3. Compression ratio
     4. Surges
     5. Tall
     6. Bleed air
   - B. Construction
     1. Materials
     2. Manufacturing processes
     3. Assembly
   - C. Type Specifics
     1. Centrifugal flow
     2. Axial flow
     3. Reverse flow
     4. Stages
     5. Split spools
     6. Fans

7. Hybrids

II. Engine Components: Compressor
   A. Principles of operation
      1. Pressure
      2. Velocity
      3. Compression ratio
      4. Surges
      5. Tall
      6. Bleed air
   B. Construction
      1. Materials
      2. Manufacturing processes
      3. Assembly
   C. Type Specifics
      1. Centrifugal flow
      2. Axial flow
      3. Reverse flow
      4. Stages
      5. Split spools
      6. Fans
      7. Hybrids
   D. Vanes
      1. Guide vane
      2. Stator vane
      3. Rotor vane
      4. Fan blades
      5. Attachment
      6. Inspection
      7. Service and maintenance
      8. Repair
      9. Overhaul

III. Engine Components: Diffuser
   A. Principles of operation
      1. Pressure
      2. Velocity
      3. Routing
      4. Mixing
   B. Construction
      1. Materials
      2. Manufacturing processes
   C. Type specifics
      1. Centrifugal
      2. Axial flow
      3. Fuel routing
      4. Mixture control
      5. Attachment
   D. Maintenance
      1. Inspection
      2. Servicing
      3. Repairs
      4. Overhaul

IV. Engine Components: Combustion
   A. Principles of operation
      1. Fuel air mixing
      2. Distribution to burners
      3. Cooling
      4. Pressure of gasses
   B. Construction

1. Materials
2. Manufacturing processes
3. Assembly

C. Type specifics
1. Can
2. Can-annular
3. Annular
4. Reverse-flow combustors
5. Stages
6. Hybrids

D. Turbine blades
1. Inlet guide vanes
2. Reaction turbine blade
3. Impulse blade
4. Turbine stators
5. Blade shrouding
6. Blade tip clearance
7. Blade cooling
8. Attachment
9. Blade failures

E. Maintenance
1. Inspection
2. Servicing
3. Repairs
4. Overhaul

V. Engine Components: Accessory Drives

A. Purpose
1. Drive pads
2. Oil pump
3. Fuel pump
4. Hydraulic pump
5. Electrical generation
6. Starter
7. Monitoring

B. Construction

C. Type specifics

D. Power inputs

VI. Engine Components: Lubricating System

A. Lubricants
1. Friction
2. Heat
3. Corrosion
4. Contaminants
5. Types
   a. Grades
   b. Additives

VII. Lubricant Systems

A. Wet sump

B. Dry sump

C. Hot tank

D. Cold tank

E. Pressure

F. Scavenge

G. Vents

H. Tanks
1. Construction
2. Purpose

I. Air oil separation

J. Pressurization
K. Bearings and seals
    1. Materials
    2. Loads
    3. Alignment
    4. Vibration
    5. Ball type
    6. Roller type
    7. Split type
    8. Lubrication
    9. Seals
        a. Carbon
        b. Labyrinth
L. Oil Pumps
    1. Gerotor type
    2. Vain type
    3. Spur-gear
    4. Pressure relief valves
M. Filters
    1. Disc type
    2. Element
    3. S
    4. By-pass system
    5. Servicing
N. Oil coolers
    1. Purpose
    2. Types
        a. Oil to air types
        b. Oil to fuel types
    3. By-pass systems
O. Maintenance
    1. Monitoring
        a. Pressure
        b. Temperature
        c. Quantity
        d. Filter by-pass
        e. Chip detection
        f. Oil analysis
    2. Inspection
    3. Servicing
    4. Repairs
    5. Overhaul

VIII. Engine Components: Propeller Reduction Gear Systems
A. Principles
    1. Transition of power
    2. Torque
    3. Assembly
B. Construction
    1. Materials
    2. Manufacturing processes
    3. Assembly
C. Type specifics
    1. Allison
    2. Garrett
    3. Pratt and Whitney
    4. General Electric
    5. Reduction Gearing
D. Maintenance

1. Inspection
2. Servicing
3. Repairs
4. Overhaul

IX. Turbine Engine Overhaul
- A. Overhaul options
  1. Complete
  2. Partial selection
     a. Compressor
     b. Turbine
     c. Reduction gear
  3. Factory service instructions
  4. When to overhaul
- B. Authorization to perform maintenance
  1. Airframe and powerplant
  2. Factor
  3. Repair stations
  4. Inspection
- C. Overhaul procedures
  1. Initial inspection
  2. Disassembly
  3. Cleaning
  4. Dimensional inspections
  5. N.D.I. inspections
     a. Magnetic particle
     b. Eddy current
     c. X-ray
     d. Ultra sound
     e. Dye-penetrate
     f. Visual
  6. Manuals
  7. Service instructions
- D. Reassembly after overhaul
  1. Layout of components
  2. Tooling and equipment
  3. Torque
  4. Pre-treatments
  5. Paperwork
  6. Final inspection

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Spring 2017

AVM 260LB Advanced Composite Aircraft Repair II Lab

Credit Hours: 3.00 **Lab Periods:** 9.00

Description:

This is the Lab portion of AVM 260. Theory and application of composite and bonded metal structures utilized in aircraft construction. Includes repair methods selection, source documents, repair methods and design criteria, bonded metal repairs, tank and non-tank processing, priming, and environmental considerations. Also includes a heavy emphasis on repair performance utilizing the Structural Repair Manuals for composite monolithic and sandwich core, and bonded metal structures.

Prerequisite(s): AVM 210/210LB.
Corequisite(s): AVM 260.

Course Learning Outcomes:

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

1. Demonstrate repair methods including speed tape, resin sealing, potting, bolted doublers, wet layup at room temperature and elevated temperature, and prepreg hot bonding.
2. Demonstrate step and taper repairs to wet layup and prepreg materials including edge and corner damage.
3. Demonstrate step and taper repairs to wet layup and prepreg materials including edge and corner damage.
4. Differentiate non-tank processing of bonded metal repairs.
5. Demonstrate hydrofluoric acid metal etching.
6. Demonstrate metal priming in preparation for metal bonding repair.

Outline:

I. Repair Methods
   - A. Speed tape
   - B. Resin sealing
   - C. Potted repairs
   - D. Bolted and bonded doubler
   - E. Pre-cure
   - F. Wet layup (room temperature)
   - G. Wet layup (elevated temperature)
   - H. Prepreg
   - I. Serrated rivet
   - J. Glass repair of aluminum

II. Structural Repair Manual General Repairs and Design Criteria (Chapter 51)
   - A. Damage removal
   - B. Line repairs
   - C. Pre-cure versus co-cure
   - D. Surface preparation
   - E. Ply orientation
   - F. Taper repairs
   - G. Step repairs
   - H. Wet lay up techniques

I. Prepreg techniques
J. Sandwich structure repair
K. Combination monolithic/sandwich repair
L. Corner repairs
M. Blind repairs

III. Non-Tank Processing
A. Phosphoric Acid Non-Tank Anodizing (PANTA)
B. Pasa-gel
C. Hydrofluoric acid
D. Abrasion

IV. Priming
A. Purpose
B. Types
C. Safety
D. Application
E. Curing and drying

Course Content Form

PIMA COMMUNITY COLLEGE

Effective Term: Full Academic Year 2017/18

GTM 105V Applied Technical Mathematics for Aviation

Credit Hours: 3.00 **Lecture Periods:** 3.00 **Lab Periods:**

Description:

Applied geometry and trigonometry operations. Includes review of basic math operations, review of pre-algebra, elements of geometry, plane trigonometry, and aviation practical applications.

Prerequisite(s): With a grade of C or better: ICS 081 or MAT 086 or completion of Module 15 in MAT 089A or satisfactory score on the Mathematics assessment test.

Course Learning Outcomes:

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

1. Use basic math operations including whole numbers, fractions, decimals, formulas, metric/ English conversions, and proportions and ratios.
2. Use algebraic techniques to set-up and solve applied problems and isolate variables in formulas.
3. Identify specific types of triangles and solve geometry problems involving triangles, circles, and right triangles with the Pythagorean theorem.
4. Calculate area and perimeter for plane figures and apply trigonometric functions to solve practical problems.
5. Complete practical math problems related to aviation.

Outline:

I. Review of Basic Math Operations
   - A. Whole numbers
   - B. Fractions
   - C. Decimals
   - D. Metric/English conversions
   - E. Proportions and ratios
   - F. Formulas

II. Review of Pre-algebra
   - A. Order of operations
   - B. Variables
   - C. Formulas
   - D. Powers
   - E. Roots

III. Elements of Geometry
   - A. Angles
     1. Measurement
     2. Practical application
     3. Conversion
     4. Complement/supplement

IV. Types
   - A. Triangles
     1. Types
     2. Pythagorean theorem
     3. Congruent
     4. Oblique
   - B. Circles
     1. Identifying parts
     2. Circle measurements
     3. Area

V. Plane Trigonometry
   - A. Right triangles
   - B. Sine, cosine, and tangent
   - C. Determining angles and sides
   - D. Area and perimeter

VI. Aviation Practical Applications
   A. Problem solving specific to a subject area
   B. Applied math models