COCONINO COMMUNITY COLLEGE
COURSE OUTLINE

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Status: Permanent

A. Identification:

1. Subject Area: FSC
2. Course Number: FSC 136
3. Course Title: FIRE APPARATUS AND HYDRAULICS
4. Credit Hrs: 4
5. Catalog Description:
   Principles of care, maintenance, and operation of fire apparatus and pumps. Pump construction, pumping and pump accessories, power development and transmission, driving, trouble shooting, and producing effective fire streams. Three lecture; two lab.

B. Course Goals:

To provide the students with hands on experience with fire apparatus and their uses on the fire ground.

C. Course Outcomes:

Students will:

1. Understand fire apparatus evolution and the pumper classifications currently in use in the fire service.
2. Recognize the types of pumps used in fire apparatus as well as the vatic theory of pumping.
3. Demonstrate safe driving procedures for driving fire apparatus as will as common causes of accidents.
4. Understand the principles and characteristics of water pressure.
5. Understand nozzle pressure and related hydraulics problems.

AND

1. Know the evaluation of fire apparatus and cite the pumper classifications currently in use in the fire service.
2. Describe the types of pumps used on fire apparatus and explain the basic theory of pumping.
3. Pump of fire apparatus following the proper procedures.
4. Cite the pump accessories provided on fire apparatus and discuss the function of each.
5. Know the relationship between status pressure, residual pressure and cavitation.
6. Identify the types of aerial apparatus including the functions and method of operating each.
7. Know safe driving procedures foe driving fire apparatus and common causes accidents.
8. Describe the principles and characteristics of water and pressure as they relate to fire streams
9. Define pounds per square inch and know the formula computing friction loss.
10. Describe the types of fire streams and general use of each.
11. Define nozzle pressure and compute related hydraulics problems.
12. Describe gallons per minute and compute related hydraulics problems.
13. Compute hydraulics problems relating to friction loss in various sizes of hose and types of appliances.
14. Perform the rules of thumb for fireground hydraulics.
15. Describe the relationship between residual and static pressure.
16. Define engine pressure and compute related hydraulics problems.
17. Define water supply and explain related hydraulic formulas.

D. Course Content:

Will include:

1. Evolution of Fire Apparatus
   a. Significant events

- b. Construction of specialized firefighting equipment
- c. Mechanical firefighting equipment
- d. Role of volunteer fire departments
- e. Steam powered pumpers
    1. horse drawn
    2. chemical engines
    3. others
- f. Self powered fire apparatus
- g. Pumper classifications
    1. triple combination
    2. quads
    3. quints
    4. water towers
    5. specialized apparatus
    6. recognized capacities
- h. Acceptance tests
    1. pumpers
    2. aerial apparatus

2. Fire Apparatus Pumps and Pump Theory
    - a. Positive displacement pumps
        1. piston
        2. rotary
            - a. vane
            - b. gear
    - b. Centrifugal pumps
        1. pressure or series position
        2. volume or capacity position
    - c. Priming pumps
    - d. Pump construction
    - e. Theoretical displacement
    - f. Slippage
3. Pumping Procedures and Accessories
    - a. Apparatus design
    - b. Hydrant operations
    - c. Drafting operations
    - d. Positioning apparatus at the fire scene
        1. safety
        2. availability of water
        3. apparatus function
        4. access
    - e. Operations inside the apparatus cab
        1. safety equipment
        2. pump gear engagement or power-trade-off
            - a. standard transmission
            - b. automatic transmission
        3. check gauges
    - f. Operations outside the apparatus
        1. pump panel
        2. fire hose and related equipment
        3. discharge and intake gates
        4. pressure control device
    - g. Gauges
        1. discharge
        2. compound
            - a. static pressure

- b. residual pressure
- 3. tachometer

h. Cooling systems
- 1. direct
- 2. indirect

4. Aerial Apparatus
   a. Types
   b. Features and functions
   c. Hydraulic systems
   d. Safety considerations
   e. Trouble-shooting
5. Driving Apparatus
   a. General approach
   b. State statutes
   c. Organizational policies
   d. route selection
   e. Defensive driving
   f. Common causes of accidents
6. Mathematics Review
   a. Basic mathematics
   b. Fractions and decimals
   c. Calculating square roots
7. Principles and Characteristics of Fire Streams
   a. Water
      1. composition
      2. heat absorbing ability
         - a. law of heat flow
         - b. law of specific heat
         - c. law of latent heat of vaporization
      3. expansion when converted to steam
      4. extinguishing capability
         - a. building fires
         - b. flammable liquid fires
         - c. fires involving energized electrical equipment

   b. Principles of pressure
      1. reaction of fluids to pressure
      2. kinds of pressure
      3. determining pounds per square inch (PSI)
      4. friction loss
      5. reaction of pressure to elevation losses or gain
      6. water hammer
8. Effectiveness of Fire Streams
   a. Influencing factors
   b. Types of fire streams
      1. solid
      2. fog
   c. Nozzles
   d. Flow capacities
   e. Reach of fire streams
   f. Master streams
9. Developing Master Streams
   a. Nozzle pressure
      1. formulas
      2. symbols
      3. constants

b. Computing gallons per minute
c. Relationship between flow and hose
d. Calculation streams
    1. friction loss in 2 1/2 hose
    2. friction loss in other hose
    3. supplying more than one hose line
    4. wired and preconnected lines
    5. siamese lines
e. Rules of thumb
f. Producing master streams
g. Relaying water
h. supplying private fire protection equipment

10. Applying Fire Streams
    a. Selecting the stream
    b. Water application
        1. rate
        2. type of nozzle and stream
    c. Problems at the nozzle
        1. nozzle reaction
        2. types of valves
    d. Residual pressure
    e. Static pressure
    f. In-Line gauges
    g. Engine pressure
    h. Supplying forward pumpers
    i. Computing capacity of tanks
    j. Computing available water in a specific area