Prepared by the Department: Social Sciences and Human Services
Date of Departmental Approval: April 2014
Date Approved by Curriculum and Programs: April 16, 2014 Effective: Fall 2014

1. **Course Number: FSC107**
   Course Title: Hydraulics for the Fire Service

2. **Description:** This course is concerned with the fundamentals of hydraulics and fluid mechanics as they relate to the firefighter and individuals involved in Fire Protection. Subjects to be studied include; principals of fluid statics, fluid motion, water supply testing, fire pump operation and fire suppression systems.

3. **Student Learning Outcomes (instructional objectives; intellectual skills):**
   a) Define basic principles of fluid movement.
   b) Describe the basic components of a municipal water supply system.
   c) Describe the main components of a fire pump each works.
   d) Describe how water is moved through hose lines, appliances and nozzles to produce an effective firefighting stream.
   e) Describe the limitations of water supply and pumping apparatus.

4. **Credits:** 3 credits

5. **Satisfies General Education Requirement:** No

6. **Prerequisites:** FSC150/FSC100 and (MAT030 or MAT035) or satisfactory basic skills assessment score

7. **Semester(s) Offered:** Varies

8. **Suggested General Guidelines for Evaluation:** Evaluation may include but is not limited to examinations, class activities, and special projects.

9. **General Topical Outline (Optional):**

FSC107. Hydraulics for the Fire Service

1. Introduction
    a. Hydraulics
        i. Hydrostatics
        ii. Hydrokinetics
    b. Pressure and Force
    c. Devices for Measuring Water Pressure
2. Energy in Fluids
    a. Potential Energy
    b. Bernoulli's Equation
3. Velocity from Nozzles and Orifices
    a. The Continuity of Flow
    b. Devices for Measuring Flow
        i. Venturi Tube
        ii. Pitut Tube
    c. Effects of Altitude
    d. Water Temperature
    e. Hydraulic Losses
    f. Discharge Coefficients
4. Nozzle Reaction
    a. Water Hammer
    b. Friction Loss in Water Conductors
    c. Effect of Flow Patter on Friction Loss
        i. Laminar Flow

a. Velocity Effects
ii. Turbulent Flow
a. Velocity Effects
d. Friction Loss in Fire Hose
i. Five Fundamental Rules
ii. Common Friction Loss Formulas
e. The Nozzle Pressure Equation
5. Water Distribution Systems
a. Hydrants
i. Types of Hydrants
ii. Head Loss
iii. Installation of Hydrants
b. Main Capacity
c. Hazen-Williams Coefficients
d. Pipe Standards
6. Hazen-Williams Equation
a. Fire Flow Tets
i. Procedure
ii. Equipment
iii. Calculations
iv. Using Results
b. Fire Service Pumps
i. General Information
a. Pump Horsepower
b. Brake Horsepower
c. Capabilities and Limits
d. Positive Pressure Used
e. Cavitation
ii. Single Stage Centifugal Fire Pumps
iii. Multi-Stature Centrifugal Fire Pumps
iv. Piston Pumps
v. Portable Pumps
vi. Gaging/Priming/Pressure Control
c. Friction Loss and Calculations
7. Engine and Nozzle Pressures
a. Underwriters Formula
b. Small Lines
c. Effects of Nozzle Diameter
d. Back Pressure
e. Estimating Engine Pressure
f. Parallel Lines
g. Nozzle Comparisons
h. Elevated Hose Lines
8. Relay Pumping
9. Fire Streams
a. Air Resistance
b. Effect of Air
c. Nozzle Performance
d. Chief Causes of Ineffective Streams
e. Stand Pipes
10. Automatic Sprinklers