

Course Objectives/Course Outline

Spokane Community College

Course Title: Principles of Hydraulics
Prefix and Course Number: FS 105

Course Learning Outcomes:

By the end of the course, a student should be able to:

- Apply the application of mathematics and physics to the movement of water in fire suppression activities.
- Identify the design principles of fire service pumping apparatus.
- Analyze community fire flow demand criteria.
- Demonstrate, through problem solving, a thorough understanding of the principles of forces that affect water, both at rest and in motion.
- List and describe the various types of water distribution systems.
- Discuss the various types of fire pumps.

Course Outline

Water as an Extinguishing Agent

- A. Physical Properties
- B. Terms and Definitions

II. Math Review

- A. Fractions
- B. Ratios, Proportions, and Percentage
- C. Powers and Roots

III. Water at Rest

- A. Basic Principles of Hydrostatics
 - 1. Pressure and Force
 - 2. Six Principles of Fluid Pressure
 - 3. Pressure as a Function of Height and Density
 - 4. Atmospheric Pressure
- B. Measuring Devices for Static Pressure

IV. Water in Motion

- A. Basic Principles of Hydrokinetics
- B. Measuring Devices for Measuring Flow
- C. Relationship of Discharge Velocity, Orifice Size, and Flow

V. Water Distribution Systems

- A. Water Sources
- B. Public Water Distribution Systems
- C. Private Water Distribution Systems
- D. Friction Loss in Piping Systems
- E. Fire Hydrants and Flow Testing
- VI. Fire Pumps
 - A. Pump Theory
 - B. Pump Classifications
 - C. Priming Systems
 - D. Pump Capacity
 - E. Pump Gauges and Control Devices
 - F. Testing Fire Pumps
- VII. Fire Streams
 - A. Calculating Fire Flow Requirements
 - B. Effective Horizontal and Vertical Reach
 - C. Appliances for Nozzles
 - D. Performance of Smooth-Bore and Combination Nozzles
 - E. Hand-Held Lines
 - F. Master Streams
 - G. Nozzle Pressures and Reaction
 - H. Water Hammer and Cavitation
- VIII. Friction Loss
 - A. Factors Affecting Friction Loss
 - B. Maximum Efficient Flow in Fire Hose
 - C. Calculating Friction Loss in Fire Hose
 - D. Friction Loss in Appliances
 - E. Reducing Friction Loss
- IX. Engine Pressures
 - Factors Affecting Engine Pressure
- X. Standpipe and Sprinkler Systems
 - A. Standpipe Systems
 - 1. Classifications
 - 2. Components
 - 3. Supplying Standpipe Systems
 - B. Sprinkler Systems
 - 1. Classifications
 - 2. Components
 - 3. Supplying Sprinkler Systems