

FIP 232
HYDRAULICS AND WATER DISTRIBUTION

COURSE DESCRIPTION:

Prerequisites: MAT 115

Corequisites: None

This course covers the flow of fluids through fire hoses, nozzles, appliances, pumps, standpipes, water mains, and other devices. Emphasis is on supply and delivery systems, fire flow testing, hydraulic calculations, and other related topics. Upon completion, students should be able to perform hydraulic calculations, conduct water availability tests, and demonstrate knowledge of water distribution systems. Course Hours Per Week: Class, 2. Lab, 2. Semester Hours Credit, 3.

COURSE OBJECTIVES:

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

- a. Calculate gallons per minute discharge rates.
- b. Calculate GPM flow from fixed rate fog nozzles
- c. Calculate GPM flow from variable rate fog nozzles
- d. Calculate friction loss in hose.
- e. Convert friction loss for different size hoses.
- f. Compute pump pressure for attack lines.
- g. Compute pump pressure for multiple lines.
- h. Compute pump pressure for master stream appliances.
- i. Compute pump pressure for relay pumping operations.
- j. Compute pump pressure for sprinkler operations.
- k. Calculate water system fire flow.
- l. Calculate water system capacity.
- m. Calculate friction loss for variable flow nozzles.

OUTLINE OF INSTRUCTION:

- I. Water as an extinguishing agent
 - a. Physical characteristics
 - b. Important terms and definitions
 - c. Summary of important concepts

- II. Hydrostatics
 - a. Basic principles of hydrostatics
 - b. Devices for measuring hydrostatic pressures
 - c. Summary of important concepts

- III. Hydrokinetics
 - a. Kinetic Energy
 - b. Conservation of energy and Bernoulli's equation
 - c. Conservation of matter
 - d. Energy Loss Due To Friction

- IV. Flow measuring devices
 - a. Common flow measuring devices
 - b. The pitot tube
 - c. Venturi Meter
 - d. Orifice plate meter

- V. Friction loss in piping systems
 - a. Determining friction loss
 - b. Reynolds numbers
 - c. Darcy-Weisbach method
 - d. Hazen-Williams formula

- VI. Analysis of looped and gridded piping systems
 - a. Determining friction loss in loops and grids
 - b. Simple Loops
 - c. Gridded piping systems

- VII. Testing and analysis of water supply systems
 - a. Flow testing
 - b. Specific test techniques
 - c. Graphical analysis of flow test results
 - d. Mathematical analysis of test results
 - e. Adjusting flow test results for friction loss and elevation differences

- VIII. Industrial fire pumps and pump installation
 - a. Common fire pump types
 - b. Pump drives
 - c. Pump controllers
 - d. Pump installation components and accessories
 - e. Component arrangement

- IX. Fire pump applications, testing, and maintenance
 - a. Standard performance specifications
 - b. Water supply requirements
 - c. Testing, inspection, and maintenance of fire pump installations

- X. Elevated storage
 - a. Plotting the supply from purely static sources
 - b. Graphically combining elevated tanks with existing water supplies

- XI. Establishing water supply requirements
 - a. Water supply requirements for exterior manual fire fighting operations
 - b. Water supply requirements for standpipe and hose systems

- c. Water supply requirements for automatic sprinkler systems
- d. Hydraulically designed water-based extinguishing systems

XII. Hydraulic calculations of automatic sprinkler systems

- a. Basic steps for Hydraulic calculations
- b. Calculations considering the impact of velocity pressures
- c. Gridded designs and computer assistance

REQUIRED TEXTBOOK AND MATERIALS:

Textbooks to be selected by instructor.

STATEMENT FOR STUDENTS WITH DISABILITIES:

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by calling 686-3652 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1309.