



Broward Community College

Course Outline

STATUS: A

COMMON COURSE NUMBER: FFP 2301

COURSE TITLE: Fire Hydraulics

CREDIT HOURS: 3

CONTACT HOURS BREAKDOWN:

Lecture/Discussion 48

Lab 00

Other 00

Contact Hours/Week 3

CATALOG COURSE DESCRIPTION:

Prerequisite: None

Corequisite: None

Introduction to the study and characteristics of hydrostatics and hydrodynamics in the fire service. Basic hydraulic measuring units, facts, theories, and formulas for problem solving.

General Education Requirements - Associate of Arts Degree, meets Area(s):
 General Education Requirements - Associate in Science Degree, meets Area(s):

UNIT TITLES:

1. Mathematics in Fire Hydraulics
2. Basic Concepts
3. Pressure
4. Velocity and Discharge
5. Friction Loss
6. Engine Pressure
7. Nozzle Pressure
8. Drafting Operations
9. Water Supply Testing

I. Course Overview:

Upon successful completion of this course, the students should be able to discuss the concepts of hydraulics related to the fire science and solve hydraulic problems by use of facts, formulas and theories.

II. Units:

Unit 1. Mathematics in Fire Hydraulics

General Outcome:

1.0 The students should be able to demonstrate an understanding of basic mathematics.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

1.1 Define the following fire service terms:

A. Hydraulic "Rule of thumb"

B. Hydraulic "Rule of hand"

1.2 Perform basic algebraic calculations.

1.3 Extract the square root.

1.4 Explain geometry axioms.

Unit 2. Basic Concepts

General Outcome:

2.0 The students should be able to demonstrate an understanding of basic hydraulic measuring units.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 2.1 Measure water in cubic feet.
- 2.2 Measure gallons of water.
- 2.3 Provide the specifications for fire department hose.
- 2.4 Determine the amount of water in relationship to the diameter of the conduit.
- 2.5 Discuss the properties of water under various conditions, ie. - heat, cooled, density, expansion, surface tension, conductivity.

Unit 3. Pressure

General Outcome:

3.0 The students should be able to determine the effects of hydraulic pressure or force that is being applied to a define area.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 3.1 Explain the relationship between height and density of liquids as it applies to pressure.
- 3.2 Explain difference between force and pressure.
- 3.3 Find pressure where height is known.
- 3.4 Find height when pressure is known.
- 3.5 Find back pressure.

Unit 4. Velocity and Discharge

General Outcome:

4.0 The students should be able to determine the velocity flow (or the rate of flow) of a fire stream as water passes a given point and calculate the discharge in gallons per minute.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 4.1 Discuss effects of turbulent and streamline flows.
- 4.2 Explain relationship between velocity and area.
- 4.3 Discuss relationship between velocity and diameter.
- 4.4 List basic discharge equations.
- 4.5 Solve discharge from nozzle pressure.
- 4.6 Determine discharge from open butts and corrective coefficients.
- 4.7 Solve sprinkler head discharges.

Unit 5. Friction Loss

General Outcome:

5.0 The students should be able to calculate friction loss and corrective measures.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 5.1 Explain the courses of friction loss.
- 5.2 List basic friction loss equations and the American Insurance Association formula.
- 5.3 Evaluate hose layout.
- 5.4 Discuss the significance of friction factors in problem solving.
- 5.5 Explain the relationship in terms of diameter.
- 5.6 Explain relationship in terms of carrying capacity.
- 5.7 Find flow from friction loss.

Unit 6. Engine Pressure

General Outcome:

6.0 The students should be able to calculate the correct pump pressures theoretically and by mathematic formula.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 6.1 Determine the effects of engine pressure by the number of hose lengths.
- 6.2 Explain the effects of elevation variations.
- 6.3 Provide the basic engine pressure equation.
- 6.4 Discuss the significance of K-valves.
- 6.5 Discuss the procedures for supplying multiple lines.
- 6.6 Explain the procedures when multiple pumpers are supplying one nozzle.
- 6.7 Discuss supplying Siamese fittings.

Unit 7. Nozzle Pressure

General Outcome:

7.0 The students should be able to demonstrate an understanding of the purpose of effective nozzle pressures and calculate appropriate nozzle pressures by mathematical formula.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 7.1 Explain the effects of elevation differences on nozzle pressure.
- 7.2 Provide the basic nozzle pressure equation.
- 7.3 Discuss the effects of friction loss on nozzle pressure.
- 7.4 Calculate individual nozzle pressure.
- 7.5 Evaluate Siamese layouts.
- 7.6 Evaluate branched lines.

Unit 8. Drafting Operations

General Outcome:

8.0 The students should be able to discuss the principles and theories of lifting water at a level lower than the pumping unit by means of atmospheric pressure and vacuum.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 8.1 Explain the limitations of lift.
- 8.2 Discuss the principles of pump priming.
- 8.3 Evaluate vacuum readings and the Bourdon gauge.
- 8.4 Discuss the effects of altitude on drafting.
- 8.5 Establish the reasons for failure of a pumper to lift water.
- 8.6 Apply simplified drafting equations.

Unit 9. Water Supply Testing

General Outcome:

9.0 The students should be able to explain the importance of water distribution systems and the significant factor they play in the control of large fires.

Specific Learning Outcomes:

Upon successful completion of this unit, the students should be able to:

- 9.1 Conduct a fire flow test.
- 9.2 Discuss variations of carrying capacities of water mains.
- 9.3 Trouble shoot poor results of fire flows.
- 9.4 Estimate available flows from hydrants.
- 9.5 Estimate static pressure.
- 9.6 Maintain an adequate water supply to sprinkler systems.