CENTRAL TEXAS COLLEGE
SYLLABUS FOR FIRT 1311
FIRE SERVICE HYDRAULICS

Semester Hours Credit: 3
INSTRUCTOR:_____
OFFICE HOURS:_____

I. INTRODUCTION

A. This course covers the fundamental concepts needed to solve a broad range of fire protection hydraulic problems. It includes the measurements of water from flowing orifices; the characteristics of water flow through conduits; the pressure, volume and frictional characteristics of mobile and stationary fire pumps; the trajectory and patterns of fire streams; and the relationship between fixed and mobile fire suppression equipment.

B. This course is an elective in the Fire Protection Technology program.

C. This course is occupationally related and serves as preparation for jobs in firefighting organizations.

II. OVERALL OR GENERAL OBJECTIVES OF THE COURSE

Upon successful completion of this course, Fire Service Hydraulics, the student will be able to:

A. Discuss and use the physical laws relating to hydrostatics and hydrokinetics.
B. Discuss the relationships that control the performance of water when it is used in the typical firefighting situation.
C. Compute discharge from a nozzle and pressure at the nozzle.
D. Describe water distribution systems.
E. Describe a fire flow test.
F. Identify and describe the function and purpose of selected fire pumps and water distribution system equipment.
G. Calculate friction loss and engine and nozzle pressure.
H. Describe the characteristics of fire streams and explain how to properly and effectively use fire streams.
I. Describe a standpipe system.
J. Describe an automatic sprinkler system.
K. Discuss uses and limitations of foam.

III. INSTRUCTIONAL MATERIALS

The instructional materials identified for this course are viewable through www.ctcd.edu/books

Currently (11/3): Michael A. Wieder, Fire Service Hydraulics and Water Supply, 2nd edition 2011, Fire Protection Publications, 9780879394141

IV. COURSE REQUIREMENTS

A. Your first responsibility is scholarship. The grade you receive for this course will not be the grade of the instructor, but the grade you and you alone earn.

B. This course is designed to require a steady, continuous effort from the student. A crash-cram policy will not result in the best grade possible. In addition to exams, factors such as class participation, initiative, attendance, and individual work will be considered in grade computation.

C. You are encouraged to give your best effort throughout the semester. From the beginning, you should plan for a steady, organized, and continuous effort, which in the long run will prove more effective for your final grade than a last minute crash-cram policy. Your course grade is not determined solely by exam grade. Such factors as class participation, initiative, attendance, and individual research papers or projects will be considered in grade computation.

D. From time to time, special library and other assignments may be made to members of the class, individually and in groups. You are expected to read all assignments and fulfill your responsibilities to any group assignments.

E. You are expected to read all assigned material and bring your textbook to class. Keep up to date and informed on assignments, especially after a period of absence.

F. Good class notes are indispensable for earning a good grade since both the material assigned and discussed will be the basis for examination material. Regular attendance is essential for the same reason.

G. Scholastic Honesty: All students are required and expected to maintain the highest standards of scholastic honesty in the preparation of all coursework and during examinations. The following are considered examples of scholastic dishonesty:

Plagiarism: The taking of passages from the writing of others without giving proper credit to the sources.

Collusion: Using another's work as one's own, or working together with another person in the preparation of work, unless such joint preparation is specifically approved in advance by the instructor.

Cheating: Giving or receiving information on examinations.

H. Special Work: Special assignments may be made during the semester, both for regular work or supplemental work.

V. EXAMINATIONS

A. There will be a minimum of three (3) major examinations as follows:

1. Three-week exam
2. Mid-term exam
3. Twelve-week exam (optional)
4. Final exam

A. Unannounced short quizzes may be given covering any material that has been assigned from the beginning of the course.

B. Occasionally a student will find it unavoidable to be absent from an exam. Only students with excused absences will be permitted to take make-up exams. Unexcused absences will result in a zero for the exam missed. The policy of the college is clearly stated in the catalog. A doctor's excuse is required in case of illness.

D. The exams may be structured to include subjective, objective, or a combination of both types of questions.

VI. SEMESTER GRADE COMPUTATION

EXAM	POINTS	POINTS	GRADES
Three Week Exam	**150**	**900-1000**	**A=4pts/sem hr.**
Mid-Term Exam	**200**	**800-899**	**B=3pts/sem hr.**
Twelve Week Exam(opt)	**200**	**700-799**	**C=2pts/sem hr.**
Final Exam	**250**	**600-699**	**D=1pt/sem hr.**
Homework/Quizzes	**200**	**0-599**	**F=0pts/sem hr.**
Total	**1,000**		

The Twelve Week Exam is optional: if it is not given, then those points will default to Homework/Quizzes and to Incentive points. Incentive points may be earned for factors such as attendance, initiative, participation in class discussions, and timely completion of assignments. Three points will be deducted for each unexcused absence. Military assignments or unavoidable circumstances will be evaluated upon notification to class instructor.

VIII. NOTES AND ADDITIONAL INSTRUCTIONS FROM COURSE INSTRUCTOR

A. Withdrawal from course: It is the student's responsibility to officially drop a class if circumstances prevent attendance. Any student who desires to, or must,

officially withdraw from a course after the first scheduled class meeting must file a Central Texas College application for Withdrawal (CTC Form 59). The withdrawal form must be signed by the student.

CTC Form 59 will be accepted at any time prior to Friday of the 12th. Week of classes during the 16 week fall and spring semesters. The deadline for sessions of other lengths is as follows:

10 week session	Friday of the 8th. Week.
8 week session	Friday of the 6th. Week.
5 week session	Friday of the 4th. Week.

The equivalent date (75% of the semester) will be used for sessions of other lengths. The specific last day to withdraw is published each semester in the Schedule Bulletin.

Students who officially withdraw will be awarded the grade of "W", provided the student's attendance and academic performance are satisfactory at the time of official withdrawal. Students must file a withdrawal application with the college before they may be considered for withdrawal.

At student may not withdraw from a class for which the instructor has previously issued the student a grade of "F" or "FN" for nonattendance.

B. An Administrative Withdrawal: An administrative withdrawal may be initiated when the student fails to meet College attendance requirements. The instructor will assign the appropriate grade on the Administrative Withdrawal Form for submission to the Registrar.

C. An Incomplete Grade: The College catalog states, "An incomplete grade may be given in cases where the student has completed the majority of the course work but, because of personal illness, death in the immediate family, or military orders, the student is unable to complete the requirements for a course…." Prior approval from the instructor is required before the grade of "I" is recorded. A students who merely fails to show for the final examination will receive a zero for the final and an "F" for the course.

D. Cellular phones and Pagers: Cellular phones and pagers will be turned off while the student is in the classroom or laboratory.

E. Americans with Disabilities Act (ADA): Disability Support Services provides services to students who have appropriate documentation of a disability. Students requiring accommodations for class are responsible for contacting the Office of Disability Support Services (DSS) located on the central campus. This service is available to all students, regardless of location. Explore the website at www.ctcd.edu/disability-support for further information. Reasonable

accommodations will be given in accordance with the federal and state laws through the DSS office.

VIII. COURSE OUTLINE

A. Unit One: Water as an Extinguishing Agent

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:
    a. Explain the basic extinguishing properties of water that make it useful for firefighting operations.
    b. List the advantages and disadvantages of water as a fire extinguishing agent.
    c. Explain how the Law of Specific Heat and the Law of Latent Heat of Vaporization relate to water as a fire extinguishing agent.
    d. Describe how the surface area of water affects its ability to extinguish fire.
2. Learning Activities:
    a. Classroom lecture/discussion
    b. Reading Assignment: Chapters 1, pages 2-12
    c. Audio Visuals Aids: Instructor's Preference
3. Unit Outline:
    a. Introduction
    b. The Basic Characteristics of Water
    c. The Basic Extinguishing Properties of Water
        1. The Law of Specific Heat
        2. The Law of Latent Heat of Vaporization
        3. Surface Area of Water
    d. Advantages and Disadvantages of Water

B. Unit Two: Water at Rest: Hydrostatics

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:
    a. Explain the basic principles of fluid pressure as they apply to water for fire protection.
    b. Explain the relationship between height and density and head pressure.
    c. Explain the importance and relevance of potential energy on water in fire protection concerns.
2. Learning Activities:
    a. Classroom lecture/discussion
    b. Reading Assignment: Chapter 2, pages 13-21
    c. Audio Visuals Aids: Instructor's Preference
3. Unit Outline:
    a. The Five Basic Principles of Pressure
    b. Head
    c. Potential Energy

C. Unit Three: Water in Motion: Hydrokinetics

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:

a. Explain the importance and relevance of kinetic energy on water in fire protection concerns.

b. Describe the principles of Conservation of Energy and Conservation of Matter.

c. Define the following terms and explain their relevance to fire protection hydraulics:

1. Atmospheric Pressure
2. Head Pressure
3. Static Pressure
4. Normal Operating Pressure
5. Residual Pressure
6. Flow (Velocity) Pressure

d. List and explain the four principles of friction loss.

e. Explain how the Darcy-Weisbach Formula and Hazen-Williams equation are used to determine the friction loss in piping systems.

2. Learning Activities:

a. Classroom lecture/discussion

b. Reading Assignment: Chapter 3, pages 23-43.

c. Audio Visuals Aids: Instructor's Preference

3. Unit Outline:

a. Introduction

b. Principles of Kinetic Energy

1. Conservation of Energy
2. Conservation of Matter

c. The Principles of Pressure

1. Atmospheric Pressure
2. Head Pressure
3. Static Pressure
4. Normal Operating Pressure
5. Residual Pressure
6. Flow Pressure

d. The Principles of Friction Loss

1. First to Fourth Principle of Friction Loss

e. Determining Friction Loss in Piping Systems

1. The Darcy-Weisbach Formula
2. The Hazen-Williams Formula

D. Unit Four: Water Distribution Systems

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:

a. List the sources of water used to supply water supply systems.

b. escribe the function of water treatment facilities in a water supply system.

c. List and describe the three basic mechanisms for moving water through a water supply system.

d. Describe the piping system used to distribute water throughout a water supply system.

2. Learning Activities:
    a. Classroom lecture/discussion
    b. Reading Assignment: Chapter 4, pages 46-66
    c. Audio Visuals Aids: Instructor's Preference
3. Unit Outline:
    a. Introduction
    b. Water System Fundamentals
    c. Water System Capacity
    d. Sources of Water Supply
        1. Surface Water Supply
        2. Ground Water Supply
    e. Water Treatment Facilities
    f. Means of Moving Water
        1. Gravity Systems
        2. Direct Pumping Systems
        3. Combination Systems
        4. Water Distribution System
    g. Water Main Valves
    h. Fire Hydrants
    i. Private Water Supply Systems

E. Unit Five: Water Flow Analysis

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:

    a. Explain the importance of conducting water supply testing on the water supply system.

    b. List and demonstrate the operation of equipment used to test a water supply system.

    c. Demonstrate the procedures for determining the flow pressure and volume from a fire hydrant.

    d. Explain the effect of the discharge opening on the flow testing process.

    e. Perform a flow test on a water supply system.

    f. Demonstrate the ability to compute flow testing results obtained during testing.

2. Learning Activities:
    a. Classroom lecture/discussion
    b. Reading assignment: Chapter 5, pages 68-89
    c. Audio Visuals Aids: Instructor's Preference
3. Unit Outline:
    a. Introduction
    b. Why Water Flow Analysis is Necessary
    c. Water Supply Analysis Equipment

d. Determining Available Water Supply
1. Flow Test Procedures
2. Computing Test Results
e. Determining Volume of Flow from Flow Hydrants
1. Calculating Flow from Test Hydrants
f. Required Residual Pressure
1. Determining Available Fire Flow

F. Unit Six: Calculating Required Fire Flows

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:

a.. Explain and utilize the three common formulas used to calculate required fire flow rates for manual firefighting operations.

b. List the fire flow requirements for automatic sprinkler and standpipe systems.

2. Learning Activities:

a. Classroom lecture/discussion
b. Reading Assignment: Chapter 6, pages 90-111
c. Audio Visuals Aids: Instructor's Preference

3. Unit Outline:

a. Introduction
b. Required Fire Flow for Manual Firefighting Operations
1. The Iowa State Formula
2. The National Fire Academy Formula
3. The ISO Formula
c. Required Fire Flow for Automatic Sprinkler Systems
1. Pipe Schedule Systems
2. Hydraulically Designed Systems
d. Required Fire Flow for Standpipe Systems
1. Class I Standpipe Systems
2. Class II Standpipe Systems
3. Class III Standpipe Systems

G. Unit Seven: Apparatus Equipped with a Fire Pump

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:

a. List and describe the characteristics of the various types of fire apparatus equipped with fire pumps, including:

Pumpers
Attack Pumpers
Wildland Apparatus
Tankers/Tenders
Aerial Apparatus
Rescue Apparatus

b. Explain the methods used for typing pumpers, wildland apparatus, and water tenders in the Incident Command System (ICS).

2. Learning Activities:
    a. Classroom lecture/discussion
    b. Reading Assignment: Chapter 7, pages 115-131
    c. Audio Visuals Aids: Instructor's Preference
3. Unit Outline:
    a. Introduction
    b. Fire Department Pumpers
    c. Initial Attack Fire Apparatus
        1. Minipumpers
        2. Midipumpers
    d. Wildland Fire Apparatus
    e. Mobile Water Supply Apparatus
    f. Aerial Apparatus Equipped with Fire Pumps
    g. Rescue Vehicles Equipped with Fire Pumps
    h. Aircraft Rescue and Fire Fighting Apparatus

H. Unit Eight: Fire Service Pump Design

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:
    a. Describe the operation of positive displacement pumps and explain their use in the modern fire service.
    b. Explain the design, components, and operating principles of single-stage and multistage centrifugal fire pumps.
    c. List and describe the various pump driver arrangements used on modern fire apparatus.
    d. Describe the various types of pressure regulating devices used on fire apparatus pumps.
    e. Explain the operation and use of flowmeters with fire pumps.
    f. List and describe the operation of the three basic types of priming devices used on modern fire pumps.
2. Learning Activities:
    a. Classroom lecture/discussion
    b. Reading Assignment: Chapter 8, pages 132-183
    c. Audio Visuals Aids: Instructor's Preference
3. Unit Outline:
    a. Introduction
    b. Positive Displacement Pumps
        1. Piston Pumps
        2. Rotary Pumps
    c. Centrifugal Pumps
        1. Principles of Operation and Construction of Centrifugal Pumps
        2. Single-Stage Centrifugal Fire Pumps
        3. Two-Stage Centrifugal Fire Pumps
    d. Mounting and Drive Arrangements
        1. Auxiliary-Engine Driven Pumps
        2. Power Take-Off (PTO) Drive

3. Front-Mount Pumps
4. Midship-Transfer Drive
5. Rear-Mount Pumps

e. Fire Pump Components
1. Automatic Pressure Control Devices
2. Pumping Priming Device
3. Auxiliary Cooling Systems
4. Pump Wear Rings
5. Pump Packing
6. Pump Piping and Valves
7. Valves
8. Pump Drains

f. Pump Panel Instrumentation
1. Master Intake and Discharge Gauges
2. Tachometer
3. Pumping Engine Coolant Temperature Indicator
4. Pumping Engine Oil Pressure Indicator
5. Pump Overheat Indicator
6. Voltmeter
7. Discharge Gauges (Pump Pressure Indicators)
8. Pumping Engine Throttle
9. Primer Control
10. Water Tank Level Indicator
11. Other Recommended Gauges
12. Flowmeters

I. Unit Nine: Fire Department Pumper Testing

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:

a. List the various types of preservice tests that are used to determine the viability of fire apparatus equipped with fire pumps.

b. Describe the procedures for performing road, hydrostatic, pumping, pumping overload, pressure control system, priming, water tank-to-pump flow, and vacuum preserve test on fire apparatus equipped with fire pumps.

c. Explain the benefits of acceptance tests and describe the types of acceptance tests that are commonly required.

d. Explain the importance of regular service testing of fire apparatus equipped with a pump.

e. Perform the following service tests on a fire apparatus equipped with a fire pump:

Engine speed check
Vacuum test
Pumping test
Pressure control test
Gauge and flow meter test

Tank-to-pump flow rate test

f. List some of the site considerations for performing serive testing of fire apparatus equipped with a fire pump.

2. Learning Activities:
   a. Classroom lecture/discussion
   b. Reading assignment: Chapter 9, pages 184-210
   c. Audio Visuals Aids: Instructor's Preference
3. Unit Outline:
   a. Introduction
   b. Preservice Testing
      1. Manufacturer's Tests
      2. Acceptance Testing
   c. Service Testing
      1. Site Considerations for Pumper Service Tests
      2. Correcting Net Pump Discharge Pressure for the Tests
      3. Equipment Needed for Service Tests
      4. Safety Precautions during Service Tests
      5. Engine Speed Check
      6. Vacuum Test
      7. Pumping Test
      8. Pressure Control Test
      9. Discharge Pressure Gauge and Flowmeter Operation Tests
      10. Tank-Pump Flow Test
      11. Reviewing the Test Results
      12. Troubleshooting during Service Testing

J. Unit Ten: Types of Fire Streams

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:

   a. Explain the characteristics of solid streams, including their flow and reach characteristics.

   b. Explain the characteristics of fog streams, including their volume, stream velocity, reach, and water particle size characteristics.

   c. Explain the characteristics of broken streams, including their flow and water particle size characteristics and their various special uses.

2. Learning Activities:
   a. Classroom lecture/discussion
   b. Reading assignment: Chapter 10, pages 212-231
   c. Audio Visuals Aids: Instructor's Preference
3. Unit Outline:
   a. Fire Stream Production
      1. Water Supply
      2. Fire Apparatus
      3. Fire Equipment
   b. Solid Streams
      1. Characteristics of Solid Streams

2. Flow Capacity of Solid Streams
3. The Reach of a Solid Stream
4. Advantages and Disadvantages of Solid Streams

c. Fog Streams
1. Characteristics of Fog Streams
2. Velocity of the Fog Stream
3. Reach of Fog Streams
4. Space Occupied by the Fog Stream
5. Size of Water Particles
6. Advantages and Disadvantages of Fog Streams

c. Broken Streams
1. Advantages and Disadvantages of Broken Streams

K. Units Eleven: Fire Hose Nozzles

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:

a. Describe the construction and explain the operation of handline and master stream solid stream nozzles.
b. Calculate the flow from a solid stream nozzle.
c. Describe the construction and explain the operation of handline and master stream fog stream nozzles, including constant flow, variable flow, and automatic fog nozzles.
d. Describe the construction and explain the operation of broken stream nozzles, including cellar, water curtain, chimney, and piercing nozzles.
e. List the appropriate nozzle discharge pressures for solid, fog, and broken stream handline and master stream nozzles.
f. Calculate nozzle reaction forces on solid and broken stream nozzles.
g. Describe various appliances that may be used with hoselines and nozzles.

2. Learning Activities:

a. Classroom lecture/discussion
b. Reading assignment: Chapter 11, pages 232-255
c. Audio Visuals Aids: Instructor's Preference

3. Unit Outline:

a. Introduction
b. Solid Stream Nozzles
1. Determining the Flow Volume from a Solid Stream Nozzle
c. Fog Stream Nozzles
1. Variable Flow Nozzles
2. Constant Flow Nozzles
3. Automatic Nozzles
d. Broken Stream Nozzles
1. Cellar Nozzles
2. Piercing Nozzles
3. Chimney Nozzles
4. Water Curtain Nozzles

e. Nozzle Pressure and Nozzle Reaction
1. Calculating Nozzle Reaction for Solid Stream Nozzles
2. Calculating Nozzle Reaction for Fog Stream Nozzles

L. Unit Twelve: Principles of Fire Service Pressure Loss Calculations

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:
a. Calculate friction loss in hose using the historical (Underwriter's Formula) method.
b. Calculate pressure loss in single and multiple hoselines using the modern $FL=CQ^2L$ method.
c. Explain the procedure for calculating the friction loss coefficient for hose used by your fire department.
d. Describe the situations in which including appliance pressure loss is important and list the appropriate appliance loss figures.
e. Determine pressure loss and gain due to changes in elevation between the pump and the nozzle.
f. Calculate total pressure loss for simple and complex hose outlays.
g. Describe the various rule of thumb and other methods for performing field calculations of pressure loss.
2. Learning Activities:
a. Classroom lecture/discussion
b. Reading assignment: Chapter 12, pages 258-316
c. Audio Visuals Aids: Instructor's Preference
3. Unit Outline:
a. Introduction
b. Historical Method of Friction Loss Calculations
1. Calculating Friction Loss for a Single 2½-Inch Hose – Flows of 100 GPM or Greater
2. Calculating Friction Loss for a Single 2½-Inc Hose – Flows of Less than 100 GPM
3. Calculating Friction Loss for Hose Other than 2½-Inch Hose
c. The Modern Friction Loss Formula
1. Calculating Friction Loss in Single Hoselines
2. Calculating Friction Loss in Siamesed Hoselines (Equal Length)
d. Determining Your Own Friction Loss Coefficients
e. Determining Elevation Pressure
f. Hose Layout Applications
1. Appliance Pressure Loss
2. Simple Hose Layouts
3. Complex Hose Layouts
4. Master Streams
g. Fireground Hydraulics Calculations
1. Flowmeters
2. Hydraulic Calculators
3. Pump Charts

4. Hand or Counting Fingers Method
5. Condensed "Q" Formula

M. Unit Thirteen: Determining Pump Discharge Pressure

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:
    a. Determine the required pump discharge pressure for simple hose layouts.
    b. Determine the required pump discharge pressure for complex hose layouts.
    c. Determine the required pump discharge pressure when supplying aerial master streams.
    d. Determine net pump discharge pressure when operating from pressurized and static water supply sources.
2. Learning Activities:
    a. Classroom lecture/discussion
    b. Reading assignment: Chapter 13, pages 318-339
    c. Audio Visuals Aids: Instructor's Preference
3. Unit Outline:
    a. Introduction
    b. Simple Hose Layouts
    c. Complex Hose Layouts
        1. Aerial Master Streams
        2. Determining Pump Discharge Pressure

N. Unit Fourteen: Relay Pumping

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:
    a. Describe the conditions that necessitate relay pumping operations.
    b. List the types of apparatus and equipoment used for relay pumping operations.
    c. Describe the operational considerations for establishing and operating a relay pumping operation.
    d. Describe the maximum distance relay method.
    e. Describe the constant pressure relay method.
    f. Describe the operational considerations for shutting down a relay pumping operation.
2. Learning Activities:
    a. Classroom lecture/discussion
    b. Reading assignment: Chapter 14, pages 340-365
    c. Audio Visuals Aids: Instructor's Preference
3. Unit Outline:
    a. Introduction
    b. Relay Apparatus, Equipment, and Terminology
    c. Relay Pumping Operational Concepts
        1. Increasing the Flow Through the Relay

2. Types of Relay Pumping Operations

d. General Guidelines for Relay Operations

1. Establishing a Relay Operation

2. Operating the Relay

3. Shutting Down the Relay

O. Unit Fifteen: Supplying Fixed Fire Suppression Systems

1. Unit Objectives: Upon successful completion of this unit, the student will be able to:

a. Explain the designs and operational principles of wet, dry, preaction, and deluge sprinkler systems.

b. List and describe the major components of an automatic sprinkler system.

c. Calculate the pump discharge pressure necessary to supply an automatic sprinkler system.

d. Explain the designs and operational principles of wet and dry standpipe systems.

e. List and describe the major components of a standpipe system.

f. Calculate the pump discharge pressure necessary to supply a standpipe system.

2. Learning Activities:

a. Classroom lecture/discussion

b. Reading assignment: Chapter 15, pages 366-409

c. Audio Visuals Aids: Instructor's Preference

3. Unit Outline:

a. Introduction

b. Automatic Sprinkler System Operations

1. Common Types of Sprinkler Systems and Their Designs

2. Automatic Sprinkler System Components

3. Preincident Inspection and Planning Procedures for Sprinkler Systems

4. Fire Department Operations at Sprinklered Occupancies

5. Hydraulic Calculations for pump Operators Supplying Sprinkler Systems

c. Standpipe System Operations

1. Standpipe System Design

2. Classification of Standpipe Systems

3. Standpipe System Components

4. Preincident Inspection and Planning Procedures for Standpipe Systems

5. Fire Department Operations at Occupancies Equipped with Standpipes

6. Hydraulic Calculations for Pump Operators Supplying Standpipe Systems

P. Unit Sixteen: Review of Class And Final Exam

1. Unit Objectives: To prepare for and take the **Final Exam**
2. Learning Activities: Review of material
3. Audio Visuals Aids: Instructor's Preference