



DEPARTMENT OF FINANCIAL SERVICES

Division of State Fire Marshal
Bureau of Fire Standards & Training

Fire Service Hydraulics

Title: Master Syllabus

Date: March 2017

Course Title	Fire Service Hydraulics
Course Number	FFP1301, BFST1301, ATPC1301
Prerequisite(s)	None
Revision Date	March 2017
College Credit Recommendation	This course has a college recommendation of 3 credits.
Continuing Education Units (CEU's)	This course does not provide CEUs
Class Days/Time	Monday – Friday 8:00 a.m. – 5:00 p.m.
Instructional Supervisor	Name: Dr. Barbara Klingensmith Email: Barbara.Klingensmith@myfloridacfo.com
Program Specialist	Name: Michael Swartz Email: Mike.Swartz@mufloridacfo.com
Class Location	Room 105
Course Description	This course covers the relationship between flow, pressure, and mathematical hydraulic formulas. The course includes pump theory, pump rating, and pressure and vacuum gauges.
Student Learning Outcomes	After the successful completion of this course, the student will be able to do the following: <ol style="list-style-type: none">1. Explain why the chemistry of water makes it an effective extinguishing agent and the physics associated with moving it.2. Discuss basic information on handline and master stream nozzles for attacking fires involving ordinary combustibles with plain water or Class A foam.3. Identify the theoretical methods of calculating pressure loss in a variety of hose lays and fireground situations.4. Identify methods for determining pressure loss and required pump discharge on the fireground.5. Discuss the critical issues that determine the usability and reliability of static water supply sources.6. Describe the various components of a relay operation, factors that influence the capability of the relay operation, and various methods for establishing a relay operation.
Required Textbook	<i>Pumping Apparatus DRIVER/OPERATOR Handbook (3rd ed.)</i> ; IFSTA Publishing (2015) ISBN: 978-087939574-2

	Chapters 5, 6, 7, 8, 11, and 12
Required Materials	Calculator with square root function.
Method of Instruction	Classroom.
Grading	Passing 70%
Certification(s)	<p>One of two required course for Pump Operator certification.</p> <p><u>FFP1302, BFST1302, or</u> APPARATUS OPERATIONS <u>ATPC1302</u></p> <p><u>FFP1301, BFST1301, or</u> FIRE SERVICE HYDRAULICS <u>ATPC1301</u></p>
Attendance Policy	You are required to attend all sessions of the course and complete all pre-course assignments. Failure to appear in class for a scheduled activity will be considered an absence. Students are allowed to miss 10% of the class and still receive credit. There are no makeup sessions.
Academic Integrity	<p>Academic integrity is crucial to the learning community and indicates respect for the college, the instructor, the course, your classmates and yourself. Any violation of this trust, including but not limited to cheating, plagiarism, collusion, or using or having any content of an un-administered test, will result in immediate dismissal from the course. Under Florida Statute 633, any student dismissed for academic dishonesty can be refused acceptance for any course administered by FSFC.</p> <p>Qualification PUMP OPERATOR Description</p> <p>Training Provider Message You must be certified by the State of Florida, as an Instructor I, II, or III, or a State of Florida recognized Fire Department, or hold a certification as a Single Course Exemption Instructor. Applications can be made through the Bureau of Fire Standards and Training. Organization Providers are Schools, Government Entities, and Businesses that need to apply and be approved by the Florida State Fire College.</p> <p>Instructor Message You may teach courses for this type of Certification or Competency only if you hold the certification, and the appropriate disciplines.</p> <p>Pre-Certification Message To be certified as a Fire Service Apparatus and Pump Operator in the State of Florida, an individual must successfully complete 80 hours of basic certification training for Apparatus and Pump Operators, or have received equivalent training in another state, and pass a state written examination. To apply for this certification, login as a student, click on Apply, select</p>

	<p>certification exam and follow the process to submission. Supporting documentation may be scanned and attached or faxed to 352-732-1374. When faxing, note "on-line application" on the fax along with a contact phone number. When taking a state exam, please ensure that your personal profile matches the identification that you plan to produce at Pearsonvue.</p>
<i>Students with Disabilities</i>	<p>Any student who has a permanent or temporary disability that may require a reasonable accommodation to participate in the course must present documentation of the disability and requested accommodation no later than the beginning of the course.</p>
<i>Emergency Evacuation Policy</i>	<p>Occupants of buildings on the Florida State Fire College campus are required to evacuate and assemble outside when a fire alarm is activated or an announcement is made. Please be aware of the following policies regarding evacuation.</p> <ul style="list-style-type: none"> • Familiarize yourself with all exit doors of the classroom and the building. • Remember that the nearest exit door may not be the one you used when you entered the building. • If you require assistance to evacuate, inform the instructor on the first day of class. • In the event of an evacuation, follow the guidance of the instructor. • Do not re-enter a building unless you are given instructions by Florida State Fire College personnel to do so.
<i>Requesting Emergency Care</i>	<p>Any request for emergency care should be initiated by calling “911” from any phone on campus of the Florida State Fire College. Phones are located in each classroom. Additionally, in the event of any emergency, immediately contact an instructor or staff member.</p>
<i>Critical Event Procedures</i>	<p>Severe Weather – there is a lightning detection system on campus which has an audible 15 second blast of an air horn. If you are outside, please follow your instructor or move to the closest permanent building. Once the threat is over, there will be three 5 second blasts of the signal.</p> <p>Security – During the daytime, security is handled by full time faculty and staff. There are security guards on duty in the evenings and weekends. Please comply with the requests made of security officers. Failure to do so can result in removal from campus.</p> <p>Student Badges – You will be issued a badge to be worn anytime you are on campus.</p>
<i>Enabling Objectives</i>	<p>Given information from discussion and reading materials, the student will perform the following objectives to a written test accuracy of at least 70% and meet the applicable job performance requirements of NFPA 1002 (2014).</p> <p><u>Chapter 5 What is Water and Where Does it Come From? (NFPA JPR 5.2.1, 5.2.2)</u></p>

1. Identify the characteristics of water.
2. List the ways in which water has the ability to extinguish fire.
3. Define heat.
4. Define latent heat of vaporization.
5. Calculate latent heat of vaporization.
6. Explain the surface area of water.
7. Explain the ways in which water smothers fire.
8. Define specific gravity.
9. List advantages and disadvantages of water as an extinguishing agent.
10. Distinguish between pressure and force.
11. Explain how force is determined.
12. State the principles of fluid pressure.
13. Define pressure and its terms.
14. Explain how to measure atmospheric pressure.
15. Calculate head pressure.
16. List causes of friction loss in fire hose.
17. List the principles of friction loss.
18. List ways to reduce friction loss.
19. Describe water hammer.
20. Name the four primary components of a municipal water system.
21. Explain the primary components of a municipal water system.
22. Discuss water main valves and water pipes.
23. Define water system consumption rates.
24. List the purposes of a private water supply system.
25. Identify the components of a private water supply system.
26. List the advantages to having separate piping arrangements in a private water supply system.

Chapter 6 Fire Hose Nozzles and Flow Rates (NFPA JPR 5.2.1)

1. Define fire stream.
2. List factors that influence a fire stream.
3. Explain why driver/operators must be knowledgeable about fire streams and nozzles.
4. Identify and list the characteristics of solid stream nozzles.
5. State the equation for determining the flow from a solid stream nozzle.
6. Calculate nozzle flow from a solid stream nozzle.
7. Identify and list the characteristics of fog stream nozzles.
8. List the factors influencing the reach of a fog stream.
9. List the types of fog stream nozzles.
10. Identify characteristics of various handline nozzles.
11. Identify the four basic categories of master stream nozzles.
12. Identify characteristics of special purpose nozzles.
13. Describe nozzle reaction.

14. Identify working limits for velocity of fire streams for various nozzles and handlines.
15. State the equation for determining nozzle reaction for solid stream nozzles.
16. State the equation for determining nozzle reaction for fog stream nozzles.
17. Calculate nozzle reaction.

Chapter 7 Theoretical Pressure Calculations (NFPA JPR 5.2.1, 5.2.2, 5.2.4)

1. Describe friction loss, elevation pressure and total pressure loss.
2. State the equation for determining friction loss.
3. Calculate friction loss.
4. Determine friction loss coefficients.
5. Test hose to determine friction loss.
6. Explain appliance pressure loss.
7. Explain facts about elevation pressure.
8. State the equations for determining elevation pressure.
9. Calculate elevation pressure.
10. Discuss hose layouts.
11. Calculate total pressure loss in single hoseline layouts, wyed hoselines of equal length, Siamese hoselines of equal length, standpipe operations, multiple hoseline of unequal length, wyed hoselines of unequal length and for manifold hoselines, and for master streams.
12. State the equation for determining pump discharge pressure.
13. Calculate pump discharge pressure.
14. State the equation for determining net pump discharge pressure (NPDP).
15. Calculate net pump discharge pressure.

Chapter 8 Fireground Hydraulic Calculations (NFPA JPR 5.2.1, 5.2.2)

1. List methods for determining pressure loss and required pump discharge pressure on the fireground.
2. Describe flowmeters and how they work.
3. Analyze water flow problems.
4. Explain the purpose of and use hydraulic calculators.
5. Discuss the use of pump charts.
6. Interpret a pump chart.
7. Create a pump chart.
8. Describe the hand method.
9. Use the hand method to calculate total pressure loss.
10. State the equations for determining friction loss using the Condensed “Q” formula.
11. Use the Condensed “Q” method to calculate total pressure loss.
12. Discuss the FPM flowing method.
13. Use the GPM flowing method to calculate total pressure loss.

Chapter 11 Static Water Supply Sources (NFPA JPR 5.2.1)

1. Define the terms associated with static water sources.
2. Discuss theoretical, maximum, and dependable lift.
3. State the equation for determining the maximum lift that a pumper can achieve.
4. Calculate maximum lift.
5. State the equations for determining pressure correction and net pump discharge pressure at draft.
6. Calculate net pump discharge pressure at draft.
7. List types of natural static water supply sources.
8. State the equation for determining the adequacy of a natural stream.
9. Calculate natural stream adequacy.
10. Discuss accessibility of natural static water supply sources.
11. Explain how to dam a stream with a ladder and salvage cover.
12. List common types of man-made static water supply sources.
13. Discuss man-made static water supply sources.
14. State the equations for determining the capacity of various kinds of pools.
15. Calculate swimming pool capacities.

Chapter 12 Relay Pumping Operations (NFPA JPR 5.2.2)

1. Distinguish among characteristics of units in a relay pumping operation.
2. Distinguish among characteristics of hose and pump appliances that may be used to assist with relay pumping operations.
3. List operational considerations for relay pumping.
4. List ways to increase the amount of flow through a relay.
5. List the four steps of a basic relay pumping operations.
6. Discuss maximum distance relay method.
7. State the equation for calculating the number of pumpers needed to relay a given amount of water.
8. Calculate the number of pumpers needed to relay a given amount of water.
9. Describe the constant pressure relay method.
10. Identify the advantages of using the constant pressure relay method.
11. List instances in which pressure may be modified in a constant pressure relay.
12. Explain how relay pressure is increased or decreased.
13. Operate a constant pressure relay.
14. Select facts about putting a relay into operation.
15. Describe operating and shutting down the relay.
16. Use a flowchart to troubleshoot relay pumping operations.