Course Information Form (CIF)

Course Code: FST 117

Course Title: Pump Operator (FAE)

Department: Allied Health
PCS Code: 1.2 - Occupational/Technical Instruction
CIP Code: 43.0203
Repeatability: 0

Effective Date: Summer 2026

Credit Hours

Catalog Notation: 3-1-3
Credit Hour Distribution:

Lecture: 3	Lab: 1	Clinical: 0	**Total: 3**

General Course Information

Catalog Description

Theoretical and practical hydraulics, maintenance procedures, and apparatus testing used by fire departments. Apparatus operators. Qualifies firefighters for OSFM Certification as a Fire Apparatus Engineer.

General Course Objectives

Train students in theoretical and practical hydraulics, and the maintenance procedures for Fire Department pumping apparatus, and provide a thorough discussion of safe driving practices.

Minimum Placement Levels

English	Reading	Math
Placement out of ENG 098	Placement out of CCS 098	Placement into MAT 059

Prerequisites

None

Methods of Evaluation

1-2 hydraulics exams, 5-8 practical skill stations, and 1 final exam.

Instructional Materials and Additional Supplies

Current edition of text that meets NFPA 1002 standards

Course Content

General Learning Outcomes (GLOs)

- Reasoning and Inquiry: Students will demonstrate the ability to solve problems using deductive reasoning and logic, quantitative reasoning, or the scientific method.

Course Segments and Student Learning Outcomes

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Introduction and Orientation to Hydraulics and Fire Apparatus Engineer	1. Identify the role and responsibility of the driver/operator. 2. Explain the following terms: atmospheric pressure, capacity, discharge velocity, displacement, flow GPM, flow pressure, friction loss, head pressure (gain or loss), hydrant pressure, vacuum, net engine pressure, normal engine pressure, normal operating pressure, nozzle reaction, PSI (pressure per square inch), pump discharge pressure, residual pressure, static pressure, vacuum, velocity, water hammer. 3. Identify the requirements for OSFM Certification as a Fire Apparatus Engineer.	3	0	0
Preventive Maintenance	1. Identify apparatus and equipment preventive maintenance requirements, including general and special purpose equipment which require that maintenance be performed in accordance with local procedures and manufacturers' technical data. 2. Relate importance of performing inspections and service functions required to assure the operational status of the apparatus and its complement of equipment.	3	0	0
Pumps	1. Explain the principles of operation, components, and advantages and disadvantages of a positive displacement pump. 2. Explain the principles of operation, components, advantages and disadvantages, and methods of power transfer from engine to pump of a centrifugal pump. 3. Identify common pump capacities. 4. Identify the operating principles of single-stage and multi-stage centrifugal fire pumps. 5. Identify the principles of drafting. 6. Identify and determine the characteristics and limitations of hard, flexible, and soft supply hose.	3	0	0
Pump Controls	1. Calculate/compute gallons per minute by using formula and rule-of-thumb methods. 2. Identify the operating principles and functions of the transfer valve. 3. Identify the pump and engine cooling devices. 4. Identify the functions and operations of priming devices. 5. Identify the operating principles and needs of the pressure control devices. 6. Identify all pump gauges and demonstrate their use.	3	0	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Water Supply	1. Identify types of hydrants. 2. Identify problems related to dead-end water mains. 3. Identify and explain the approximate pressure-discharge relationship for various water pipe sizes given reference materials. 4. Identify at least two causes of increased resistance or friction loss with water flowing in water mains. 5. Identify the NFPA recommended color code system for fire hydrants. 6. Identify private water supply systems and explain the operation, care, and maintenance of those systems. 7. Determine and calibrate/calculate the expected fire flow, given a specified location, a water source, and water supply information for that location, so that the amount of water available for firefighting at the location is estimated and alternative sources of water are identified. 8. Identify the components of mobile water supply operations. 9. Demonstrate the positioning of a fire department pumper to operate at a fire hydrant and static supply source utilizing each existing pumper intake connection (given a pumper, a length of intake hose, and appropriate fittings or tools) so that the intake hose can be connected, without kinks, to the pump connection and without repositioning the vehicle.	3	1	0
Hydraulic Calculations	1. Identify and demonstrate the use of proportions in mathematical calculations as required to solve fire department pumper hydraulic problems. 2. Demonstrate mentally calculated engine pressures required to supply elevated streams. 3. Identify GPM flows at standard tip pressures. 4. Identify the elements of friction loss. 5. Demonstrate how to mentally calibrate pump pressure, GPM, friction loss, and nozzle pressure given a series of fire ground situations.	3	1	0
Pump Operations	1. Determine nozzle or pump discharge pressures when the length and size of nozzle is given, water flow in gallons per minute (GPM) is given, when the diameter of the orifice and pressure at the orifice are given, friction loss in the supply and attack lines when the GPM is given, friction loss in Siamese lines when size of hose and GPM flow are given, friction loss in wyed lines when size of hose and GPM flow are given, and friction loss in multiple lines when the size of hose and GPM flow are given. 2. Estimate remaining available volume from a hydrant while pumping a given volume. 3. Demonstrate the method(s) of power transfer from vehicle engine to pump given a fire department pumper. 4. Produce effective hand and master streams specified by the course content given a fire department pumper and a series of fire ground situations. 5. Demonstrate correct operations of the throttle to obtain and maintain each discharge pressure, within 10 psi (plus or minus) of the required pressures. 6. Demonstrate a systems check when the pumper will not draft given a fire department pumper and drafting conditions. 7. Demonstrate the following operations: pump at maximum delivery rate from the apparatus water tank; pump at maximum rated capacity from a hydrant; pump at maximum rated capacity from draft; and pump in relay (in-line) operation, per course handout given a fire department pumper.	6	2	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Pump Operations (cont'd)	8. Demonstrate the operation of the volume/pressure transfer valve under actual pumping conditions given a fire department pumper with multistage pump. 9. Identify the type, design, operation, nozzle pressure, and flow in GPM for proper operation of each as described in course content given a selection of nozzles and tips. 10. Demonstrate the operation of the pumper pressure relief system, or the pressure control governor, or both given a fire department pumper. 11. Demonstrate the operation of the auxiliary cooling system given a fire department pumper. 12. Identify the capabilities and limitations of the water supply operations given a series for fire ground situations. 13. Identify four types of master stream devices; purpose of stream straighteners; friction loss elements for course purposes; operating pressures; pressures for fog and smooth bore tip nozzles; rules for applying master streams; angle of penetration and deflection of effective fire streams; limits and correct placement of apparatus to achieve maximum results. Identify the method of calculating engine pressure including friction loss for aerial ladder pipes, elevation (head pressure), and loss for pre-piped waterways. 14. Identify the correct operation of discharge gate valves in such a manner as to reflect an understanding of principles learned in the classroom. 15. Identify the function of the bleeder valves, drain valves, tank to pump valve, and re-circulating valves. 16. Identify the function of throttle, proportioners, gauge dampers, grease fittings, panel lights, tank fill discharge outlets, water tank level gauge, and intakes (ports and/or gates).			
Support of Sprinkler/Standpipe Systems	1. Demonstrate the direction of water flow through the valve given a check valve on the fire department connection to an automatic sprinkler system. 2. Demonstrate the method specified to supply water to fire sprinkler and standpipe systems, given specific system information and a fire department pumper, so that water is supplied to the system at the proper volume and pressure. 3. Identify the number of sprinkler heads that can be adequately supplied by various capacity fire department pumpers given specific information on a sprinkler system. 4. Calculate the hose layouts, pump discharge pressure, and procedures to adequately supply water to that sprinkler system given specific information on a sprinkler system. 5. Calculate the hose layouts, pump discharge pressure, and procedure to adequately supply water to that standpipe system given specific information on a standpipe system. 6. Identify the proper methods and procedures to supply a standpipe system if the fire department connection is not usable. 7. Identify at least one method of determining actual water flow into a standpipe system, using handout content example.	3	1	0
Foams and Foam Production Equipment	1. Compare classifications and types of foams, their capabilities, limitations, and the operating principles of proportioning devices. 2. Identify matching nozzles and proportioning devices and figure percentages of foam and water. 3. Calibrate and construct the type, design, operation, operating pressure, and flow in GPM for proper operation of each given a selection of foam nozzles and eductors.	3	2	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Pumping Apparatus Testing	1. Identify requirements that the pump be tested for certification in accordance with NFPA 1901, Chapters 12-13. 2. Identify requirements that the pump be tested for delivery as specified by purchaser. 3. Describe the following per NFPA 1911, Chapter 3: the frequency and requirements for pump service tests; duration of service tests; agency responsible for conducting service tests; the equipment required to perform the service test; and lift height required for the service test. 4. Identify from the dry vacuum test standards the following: purpose of the test; methods of testing; duration of test; and testing variations. 5. Describe the following terms from NFPA 1901, Chapters 2-12: loading, acceleration and speed, time and distance requirements, and required braking tests. 6. Demonstrate the proper operation of the pressure relief devices.	3	2	0
Troubleshooting	1. Describe the following common problems which occur while pumping, including the following conditions that may result in pump damage or unsafe operations and their solutions: cavitation; leaking fuel, oil, or water; overheating; unusual noises; vibrations; water hammer; pump engagement indicator lights; improper use of pressure relief or governing systems; transfer valve; and failure to prime or loss of prime. 2. Determine the following common problems which occur while pumping, including the following conditions that may result in pump damage or unsafe operations and their solutions: cavitation; leaking fuel, oil, or water; overheating; unusual noises; vibrations; water hammer; pump engagement indicator lights; improper use of pressure relief or governing systems; transfer valve; and failure to prime or loss of prime; and formulate a solution to address the situation.	3	2	0
Authority Having Jurisdiction Responsibilities (FSVO)	1. Recognize importance of being licensed to drive all vehicles expected to operate, in accordance with applicable state and local laws. 2. Drive fire department vehicles or apparatus under emergency response conditions, meeting the objectives specified in Chapter 2, Driving/Operating. 3. Demonstrate the recording and the reporting, as specified by the authority having jurisdiction, of all servicing functions. 4. Identify all applicable state and local laws of the authority having jurisdiction, including rules and regulations governing the safe driving and operating of fire department vehicles. 5. Identify all automotive gauges and demonstrate their usage given a fire department vehicle. 6. Determine the expected fire flow, given a specific location, a water source, and water supply information for that location, so that the amount of water available for firefighting at the location is estimated and alternative sources of water are identified. Identify the pipe sizes used in water distribution systems for residential, business, and industrial districts served by the authority having jurisdiction. 7. Locate, identify, and demonstrate the operation of all equipment carried on or attached to a fire department pumper. 8. Demonstrate the method specified to supply water to fire sprinkler and standpipe systems, given specific system information and a fire department pumper, so that water is supplied to the system at the proper volume and pressure.	2	2	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Authority Having Jurisdiction Responsibilities (FSVO) (cont'd)	9. Pump a supply line of 2-1/2 in. (65 mm) or larger, given a relay pumping evolution, the length and size of the line, desired flow and intake pressure, so that the proper pressure and flow are provided to the next pumper in the relay. 10. Produce a foam fire stream, given foam producing equipment, so that properly proportioned foam is provided. 11. Change water supply from the apparatus water tank to an external source, given a pumper with an operating fire attack line of 1 1/2 in. (38 mm) or larger, so that the flow of water to the attack line is not interrupted and the proper pressure is maintained. 12. Perform the specified routine tests, inspections, and servicing functions listed below, in addition to those contained in 2-2.1, given a fire department pumper and its manufacturer's specifications, so that the operations status of the pumper is verified. 13. Demonstrate fitness for duty by passing periodic medical evaluation, as specified by the authority having jurisdiction, to determine physical ability adequate for performance of duties as an operator of fire department vehicles.			
NFPA 1500 Standards (FSVO)	1. Meet the requirements specified in Chapter 3. 2. Obtain or possess a valid driver's license. 3. Operate a vehicle in compliance with all traffic laws, including sections pertaining to emergency vehicles, and any other requirements of the authority having jurisdiction. 4. Obey all traffic control signals and signs and all laws and rules of the road of the jurisdiction for all the operation of motor vehicles during non-emergency travel. 5. Demonstrate responsibility for the safe and prudent operation of fire department vehicles under all conditions.	2	0	0
Aerial Apparatus Objectives	1. Demonstrate capability to perform the routine tests, inspection, and servicing functions listed below, in addition to those specified in 2-2.1, given a fire department aerial apparatus, so that the operation readiness of the aerial apparatus is verified: cable systems (if applicable); aerial device hydraulic systems; slides and rollers; stabilizing systems; aerial device safety systems; breathing air systems; and communication systems. 2. Perform the practical driving exercises specified in 2-3.2 through 2-3.5, given a fire department aerial apparatus and a spotter for backing, so that each exercise is performed safely without striking the vehicle or obstructions. 3. Operate a fire department aerial apparatus over a predetermined route on a public way using the maneuvers specified in 2-3.1 so that the vehicle is safely operated in compliance with all applicable state and local laws, departmental rules and regulations, and the requirements of NFPA 1500, Section 4-2. 4. Demonstrate the knowledge of the capabilities and limitations of aerial devices related to reach, tip load, angle of the inclination, angle from chassis axis, effects of topography, ground and weather conditions on safe deployment, and use of the aerial device.	5	2	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Aerial Apparatus Objectives (cont'd)	5. Demonstrate knowledge of the aerial apparatus hydraulic systems, manufacturer's specifications for stabilization, stabilization requirements, the effect of topography, and ground conditions on safe stabilization. 6. Demonstrate knowledge of the aerial device hydraulic systems, hydraulic pressure relief systems, gauges and controls, cable systems, communication systems, electrical systems, emergency operating systems, locking systems, manual rotation and lowering systems, stabilizing systems, aerial device safety systems, system overrides and the hazards of using overrides, safe operational limitations of the given aerial device, safety procedures specific to the device, and operations near electrical hazards and overhead obstructions. 7. Demonstrate the ability to lower the aerial device using the emergency operating system so that the aerial device is safely lowered to its bedded position. 8. Demonstrate knowledge of nozzle reaction, range of operation, and weight limitations.			

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
45	15	0