FIRE 009: FIRE PROTECTION HYDRAULICS AND WATER SUPPLY

New Course Proposal

Date Submitted:Fri, 07 Jun 2019 21:43:17 GMT

Originator

asventura

Justification / Rationale

Add elective course to the Fire Technology Associate Degree for Employment Preparation. This degree requires 22 fire elective units in addition to the 18 required units. Many students pursuing this degree path are able to acquire the 22 elective units by attending the fire academy which provides 18.5 units. Those students seeking a career in fire prevention, code enforcement, safety education or plan reviews have difficulty meeting this requirement. Adding this elective course provides fire prevention students an opportunity to earn the needed electives for this degree.

Effective Term

Fall 2020

Credit Status

Credit - Degree Applicable

Subject

FIRE - Fire Technology

Course Number

009

Full Course Title

Fire Protection Hydraulics and Water Supply

Short Title

HYDRAULICS AND WATER SUPP

Discipline

Disciplines List
Fire Technology

Modality

Face-to-Face

Catalog Description

This course provides the Fire Technology student with a foundation of theoretical knowledge in order to understand the principles of water usage in fire protection. Students learn to apply hydraulic principles to analyze and solve water supply problems. Topics include the design principles of fire service pumping apparatus, community fire flow demand criteria, pump theory, pumping and hydraulic calculations, fire ground hydraulics, drafting operations, and the testing and inspecting of water-based suppression systems.

Schedule Description

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Lecture Units

3

Lecture Semester Hours

54

Lab Units
0

In-class Hours
54

Out-of-class Hours
108

Total Course Units
3

Total Semester Hours
162

Prerequisite Course(s)
Advisory: ENG 061 & MATH 065

Required Text and Other Instructional Materials

Resource Type
Book

Open Educational Resource
Yes

Author
William F. Crapo

Title
Fire Protection Hydraulics and Water Supply

Edition
Third

City
Burlington, MA 01803

Publisher
Jones and Bartlett Learning

Year
2017

College Level
Yes

Flesch-Kincaid Level
12th grade

ISBN #
978128405852-9

Class Size Maximum
30

Entrance Skills
Write organized summaries and responses to readings.

Requisite Course Objectives
ENG 061-Use theses to organize paragraphs into coherent analyses.
ENG 061-Demonstrate the ability to think critically and express ideas using various patterns of development.

ENG 061-Recognize features of style such as purpose, audience and tone integrate these elements into academic and professional writing.
ENG 061-Utilize a handbook to properly cite and document source material in MLA format.

Entrance Skills

Ability to perform basic mathematical operations, unit measure, rounding, and conversions.

Requisite Course Objectives

MATH 065-Demonstrate proficiency in basic number facts (addition, subtraction, multiplication, division of integer numbers).
MATH 065-Convert between improper fractions and mixed numbers.
MATH 065-Compute using the four basic operations of addition, subtraction, multiplication, and division on the rational numbers in both fraction and mixed number forms.
MATH 065-Apply the basic operations to solve application problems that involve integer numbers, decimals, mixed numbers and rational numbers.
MATH 065-Use rounding and estimation to solve problems involving rational numbers, mixed numbers and decimals.
MATH 065- Apply methods of conversion between percents, decimals, and fractions.
MATH 065- Determine the solution to equations involving percents by deductive reasoning.
MATH 065- Recognize and convert between units of measurements in the American and metric systems involving rational numbers, mixed numbers and decimals using conversion factors or proportions.

Course Content

1. Principles of fire department hydraulics
    a. Water – the primary extinguishing agent.
    b. Principles of water pressure.
    c. Head pressure.
    d. Elevation pressure.
    e. Principles of force in water.
    f. Force on the base of a container.
    g. Force on clapper valves.
    h. Bernoulli's Principle.
        i. Water tanks and hose capacity.
            1. Square feet and cubic feet.
            2. Squares, rectangles, and circles.
            3. Volume capacity of containers.
            4. Fire hose.
        ii. Water supply and testing procedures
            1. Types of water systems.
            2. Capacity of systems.
            3. Distribution systems.
            4. Emergency provisions.
            5. Fire flow test.
            6. Water supply maps.
            7. Needed fire flow for individual buildings.
        iii. Fire streams
            1. Fire stream tactics.
            2. Solid streams.
            3. Stream penetration.
            4. Non-solid fire streams.
            5. Types of combination nozzles.
            6. Fixed-gallonage or constant-flow nozzles.
            7. Selecting a nozzle.
            8. Velocity flow.
            9. Nozzle reaction.
            10. Nozzle reaction on fog nozzles.
            11. Water hammer.
2. Discharge

a. Fire sprinkler systems.
b. Types of systems.
c. Water supply.
d. Sprinkler heads.
e. Sprinkler head discharge.
f. Other major sprinkler system components.
g. Fire department operations.
h. Standpipe systems.
i. Development of a discharge formula.
j. Estimating the flow from a hydrant outlet.
k. Comparing discharge.
l. Equivalent nozzle diameter.

3. Friction loss principles and application
   a. Friction loss principles.
   b. The friction loss formula.
4. Required pump discharge pressure
   a. Development of the required pump discharge formula.
   b. Required pump discharge pressure problems.
5. Unusual and complex problems
   a. Understanding the attack pumper.
   b. Unusual problems.
   c. Complex problems.
6. Pumps, pump accessories, and drafting operations
   a. Main pumps.
   b. Booster pumps.
   c. Priming pumps.
   d. The theory of positive-displacement pumps.
   e. The theoretical discharge of a positive-displacement pump.
   f. Types of positive-displacement pumps.
   g. Centrifugal pumps.
   h. Inspection tests.
   i. The service test.
   j. Troubleshooting.
   k. Pump accessories.
   l. Pump safety items.
   m. Technological advances.
   n. Drafting operations.
   o. Drafting from a broken connection.
7. Relay operations
   a. Pumpers used in relay operations.
   b. Factors to be considered in relay operations.
   c. Small-quantity operations.
   d. Large-quantity operations.
   e. Adjusting the planned relay.
   f. Operational considerations.
   g. Simplified relay operations.
8. Fire ground hydraulics
   a. The pump discharge e#ect on nozzle pressure.
   b. Initial pressures.
   c. The tip in use.
   d. The length of the line.
   e. Standards and allowances for handheld lines.
   f. Fog nozzles.
   g. Solving problems for handheld lines.
   h. Master streams.

i. Using a reference chart.
j. The hand method for determining friction loss in hose.

Course Objectives

	Objectives
Objective 1	Apply the application of mathematics and physics to the movement of water in fire suppression activities.
Objective 2	Analyze community fire flow demand criteria.
Objective 3	Demonstrate, through problem solving, the understanding of the principles of forces that affect water, both at rest and in motion.
Objective 4	Discuss the various types of fire pumps.
Objective 5	Apply water hydraulic principles.
Objective 6	Demonstrate knowledge of water hydraulics as it relates to fire protection.

Student Learning Outcomes

	Upon satisfactory completion of this course, students will be able to:
Outcome 1	Identify the design principles of fire service pumping apparatus.
Outcome 2	Apply the principles of mathematics and physics to the movement of water in fire suppression activities.
Outcome 3	Describe the various types of water distribution systems.

Methods of Instruction

Method	Please provide a description or examples of how each instructional method will be used in this course.
Lecture	Classroom lectures pertaining to each chapter.
Technology-based instruction	Calculate hydraulic formulas.
Demonstration, Repetition/Practice	Repetition and practice of mathematical equations.
Participation	Student participation in solving hydraulic formulas.
Activity	Group activities of calculating scenario based hydraulic formulas.

Methods of Evaluation

Method	Please provide a description or examples of how each evaluation method will be used in this course.	Type of Assignment
Tests/Quizzes/Examinations	Complete 14 chapter quizzes in class and practice quizzes for homework provides knowledge retention.	In and Out of Class
Computational/problem-solving evaluations	Complete 14 chapter workbook assignments will provide foundation from which student learning will be established.	In and Out of Class
Written homework	Computation homework of hydraulic formulas provide basis of student comprehension.	Out of Class Only
Self-paced testing,Student preparation	Complete 14 Chapter Pre-Assessment chapter assignments provides initial student understanding of content.	Out of Class Only

Assignments

Other In-class Assignments
1. Classroom participation
2. Review of handouts and case studies
3. Review weekly chapter content in textbook
4. Practice computation of mathematical equations

Other Out-of-class Assignments
1. Read weekly textbook chapters (25-30 pages) and review additional handouts
2. Complete 14 workbook assignments

3. Memorize and practice application of hydraulic formulas
4. Practice computation of mathematical equations

Grade Methods
Letter Grade Only

MIS Course Data

CIP Code
43.0203 - Fire Science/Fire-fighting.

TOP Code
213300 - Fire Technology

SAM Code
C - Clearly Occupational

Basic Skills Status
Not Basic Skills

Prior College Level
Not applicable

Cooperative Work Experience
Not a Coop Course

Course Classification Status
Credit Course

Approved Special Class
Not special class

Noncredit Category
Not Applicable, Credit Course

Funding Agency Category
Not Applicable

Program Status
Program Applicable

Transfer Status
Not transferable

Allow Audit
No

Repeatability
No

Materials Fee
No

Additional Fees?
No

Approvals

Curriculum Committee Approval Date
10/01/2019

Academic Senate Approval Date
10/10/2019

Board of Trustees Approval Date
11/13/2019

Chancellor's Office Approval Date
12/09/2019

Course Control Number
CCC000609663

Programs referencing this course
Fire Technology Certificate of Achievement (http://catalog.collegeofthedesert.eduundefined?key=146/)
Fire Technology AS Degree (employment preparation) (http://catalog.collegeofthedesert.eduundefined?key=63/)