COURSE OUTLINE
Fire Protection Systems

Course Description
FS 145. Fire Protection Systems. 3 hours credit. This course will enable the student to identify features of design and operations of fire alarm systems, water-based fire suppression systems, special hazard fire suppression systems, water supply for fire protection, and portable fire extinguishers.

Required Materials
For complete material(s) information, refer to https://bookstore.butlercc.edu

Butler-assessed Outcomes
1. The intention is for the student to be able to: Identify and describe various types and uses of fire protection systems
2. Describe the basic elements of a public water supply system as it relates to fire protection.

Learning Outcomes
Taken from the National Fire Academy FESHE Model Curriculum.
1. Explain the benefits of fire protection systems in various types of structures.
2. Describe the basic elements of a public water supply system.
3. Explain why water is a commonly used extinguishing agent.
4. Identify the different types and components of sprinklers, standpipes, and foam suppression systems.
5. Describe residential and commercial sprinkler legislation.
6. Identify the different types of non-water based fire suppression systems.
7. Explain the basic components of a fire alarm system.
8. Identify the different types of detectors and explain how they operate.
9. Describe the hazards of smoke and list the four factors that can influence smoke movement in a building.
10. Discuss the appropriate application of fire protection systems.
11. Explain the operation and the appropriate application for the different types of portable fire protection systems.

Learning PACT Skills that will be developed and documented in this course
Through involvement in this course, the student will develop ability in the following PACT skill area(s):

Analytical Thinking Skills
- Problem solving - Through research and review of current fire protection systems and designs, the student will apply principles learned to identify proper fire protection systems for various facilities.
Technology Skills
Discipline-specific technology - Through examination of various types of fire protection systems, the student will gain an increased knowledge of the fire protection systems, components, and properties.

Major Summative Assessment Task(s)
These learning outcome(s) and the Learning PACT skill(s) will be demonstrated by:
1. Completing a research project detailing fire protection and detection systems.

Skills or Competencies
Actions that are essential to achieve the course outcomes: (The following skills and competencies are taken from the National Fire Protection Association Standards and the Fire and Emergency Services Higher Education Model and incorporated into each specific course.)
A. Automatic sprinkler systems
   1. Identify the parts of a sprinkler head
   2. Describe the pendant, upright, and sidewall sprinkler design
   3. Identify automatic sprinkler head release mechanisms
   4. Identify the main control valve on an automatic sprinkler system
   5. Identify sprinkler system control valve
   6. Demonstrate the operation of a sprinkler control valve
   7. Identify a sprinkler system’s fire department connection
   8. Demonstrate connecting a houseline to a sprinkler system fire department connection
   9. Describe a wet pipe sprinkler system
   10. Describe a dry pipe sprinkler system
   11. Describe a deluge sprinkler system
   12. Describe a pre-action sprinkler system
   13. Identify the various components of a sprinkler system
B. Standpipe system
   1. Identify a Class I system
   2. Identify a Class II system
   3. Identify a Class III system
   4. Describe the procedures for inspection and testing of standpipe systems
   5. Identify the fire department connection
C. Fire pumps
   1. Describe the operation of positive displacement pumps
   2. Explain the design, components, and operating principles of single and multistage centrifugal fire pumps
   3. Describe the difference in the types of pump drivers
   4. Describe the requirements for testing, inspecting, and maintaining fire pumps
D. Portable fire extinguishers
   1. Identify types of portable fire extinguishers
   2. Describe the portable fire extinguisher rating system
   3. Describe the types of extinguisher agents
   4. Match extinguisher symbol shapes to fire classification letters
5. Match extinguisher pictographs to the extinguisher’s intended application
6. Identify factors for selecting the proper fire extinguisher
7. List general guidelines for portable extinguisher operations
8. Demonstrate use of a fire extinguisher to extinguish a Class A, Class B, and Class C fire
9. Demonstrate an inspection of a fire extinguisher, checking for damage and obsolescence

E. Special extinguishing systems
1. Describe the set-up of a wet chemical system
2. Describe the set-up of a dry chemical system
3. Explain the dangers of a carbon dioxide system
4. Describe how foam is generated to form a coating blanket
5. Describe how foam extinguishes fire
6. Describe the procedure for testing, inspecting, and maintaining special extinguishing systems

F. Fire detection and signaling systems
1. Describe the types of alarm initiating devices
2. Describe the function of heat detectors
3. Describe the function of smoke detectors
4. Describe the function of flame detectors
5. Describe the function of fire-gas detectors
6. Analyze the need for having a variety of alarm-indicating devices
7. Describe the types of automatic alarm systems
8. Describe supervising fire alarm systems and their function
9. Identify auxiliary services provided by fire and alarm systems
10. Describe water flow alarms and their function

G. Water system fundamentals
1. Identify correct definition and terms associated with water supply
2. Identify the four fundamental components of a modern water system
3. Explain methods of moving water from municipal supply to distribution systems
4. Explain the function of a processing or treatment facility and tell what the fire department’s main concern is regarding these facilities
5. Identify the parts of a water distribution system
6. State the recommended water distribution system pipe sizes for residential, business and industrial, and long mains
7. Identify types of water main valves
8. Identify causes of friction loss in water mains
9. Identify the purpose of private water supply systems
10. List advantages of separating piping for fire protection and domestic/industrial

H. Fire hydrants
1. Describe the components of a fire hydrant
2. Describe a wet barrel hydrant
3. Describe a dry barrel hydrant
4. Identify conditions that reduce hydrant effectiveness
5. Demonstrate the ability to measure and record hydrant flow pressures
6. Define the purpose of marking fire hydrants by color
7. Explain the purpose for location markers on hydrants
8. Demonstrate fully opening and closing a fire hydrant
9. Demonstrate hydrant inspection

I. Fire flow testing
   1. Explain the importance of conducting water supply testing on the supply
   2. List and demonstrate the operation of equipment used to test a water supply system
   3. Demonstrate the procedure for determining the flow pressure and volume for a fire hydrant
   4. Explain the effect of the discharge opening on the flow testing process
   5. Perform a flow test on a water supply system
   6. Demonstrate the ability to compute flow test result obtained during water supply testing

J. Static sources of water
   1. Identify terms associated with static water sources
   2. Define natural water sources
   3. Demonstrate the ability to calculate maximum lift
   4. Demonstrate the ability to calculate net pump discharge pressure at draft
   5. Identify accessibility and reliability of static water sources
   6. Demonstrate the ability to calculate natural stream adequacy
   7. Demonstrate the ability to dam a stream with a ladder and salvage cover
   8. Describe the methods of accessing frozen lakes and ponds
   9. Demonstrate the ability to calculate swimming pool capacities
   10. Identify alternative static water supply sources

K. Relay operations
   1. Define a relay operation
   2. Describe the conditions that would necessitate relay pumping operations
   3. Compose a procedure that address a relay operation
   4. List the types of apparatus and equipment used for relay pumping operations
   5. Describe the operational considerations for establishing and operating a relay pumping operation
   6. Describe the maximum distance relay method
   7. Describe the constant pressure relay method
   8. Describe the operational considerations for shutting down a relay pumping operation

L. Shuttle operations
   1. Define shuttle operation
   2. Compose a procedure that addresses a shuttle operation
   3. Explain the three crucial decisions that must be made at the very beginning of a successful water shuttle
   4. Contrast gravity and jet assist dumps
   5. List disadvantages of jet assist dumps
   6. Compose guidelines for positioning the fill site apparatus
   7. Identify procedures for laying out the fill site
   8. Describe the top fill methods
   9. Demonstrate ability to operate at a fill site as part of a water shuttle operation
10. Describe dump site operational methods
11. Compare and contrast water tender discharge methods
12. Describe portable tank operations at the dump site
13. Demonstrate ability to set up a portable water tank
14. Demonstrate ability to operate at a portable water tank dump site as a part of a water shuttle dump site
15. Demonstrate ability to calculate tender flow rates

Learning Units
I. Fire extinguishing agents and portable fire extinguishers
   A. Symbols
   B. Ratings
   C. Agents
   D. Types of extinguishers
   E. Proper selection and distribution of extinguishers
   F. Installation and placement
   G. Inspect, maintain, and recharging
   H. Hydrostatic testing

II. Fire detection and signaling systems
   A. System components
   B. Types of signaling systems
   C. Manual alarm initiation devices
   D. Automatic alarm initiation devices
   E. Inspection and testing fire detection and signaling systems
   F. Proper documentation

III. Water supply
   A. Characteristics of water
   B. Water pressure
   C. Friction loss
   D. Municipal water supply
   E. Private water supply
   F. Water supply requirements for standpipe systems
   G. Water supply requirements for automatic sprinkler systems

IV. Fire pumps
   A. Types of fire pumps
   B. Pump drivers
   C. Pump controllers
   D. Pump accessories
   E. Test, inspection and maintenance of fire pumps

V. Standpipe and hose systems
   A. Classification of standpipe systems
   B. Types of standpipe systems
C. Fire department connections  
D. Water supply considerations  
E. Water pressure considerations  
F. Inspection and testing of standpipes

VI. Automatic sprinkler systems  
A. Components  
B. Sprinkler system piping and valves  
C. Fire department connections  
D. Types of sprinkler systems  
E. Inspection and testing of sprinkler systems  
F. Sprinkler systems restoration  
G. Sprinkler system impairment controls  
H. Residential sprinkler systems

VII. Special extinguishing systems  
A. Wet chemical extinguishing systems  
B. Dry chemical systems  
C. Gaseous systems  
D. Foam extinguishing systems

**Learning Activities**  
Activities will include, but not be limited to, class discussions, lectures, classroom exercises, course projects, and field trips.

**Grade Determination**  
The student will be evaluated through written exams, skill proficiency assessments, and other methods of evaluation at the discretion of the instructor.