Lassen Community College Course Outline

FS 13 Fire Behavior and Combustion 3.0 Units

I. Catalog Description
This course of study presents theories and fundamentals of how and why fires start, spread and are controlled; an in-depth study of fire chemistry and physics; fire characteristics of materials; extinguishing agents; and fire control techniques. This course has been approved for online delivery.

Recommended Preparation: Successful completion of ENGL105 or equivalent assessment placement.

Transferable to CSU
51 Hours Lecture
Scheduled: Fall (even)

II. Coding Information
Repeatability: Not repeatable
Open Entry/Open Exit: NA
Grading Option: Option
Credit Type: Credit – Degree Applicable
TOP Code: 2133.10

III. Course Objectives
A. Course Student Learning Outcomes
Upon completion of this course the student will be able to:
1. Define basic terms and concepts related to fire behavior and chemistry.
2. Identify states of matter and describe chemical processes associated with combustion
3. Analyze physical conditions which determine states of matter and influence fire behavior.
4. Describe fire suppression agents and their properties.
5. Compare and contrast methods and techniques of fire extinguishment.

B. Course Objectives
Upon completion of this course the student will be able to:
1. Identify physical properties of the three states of matter.
2. Categorize the components of fire.
3. Recall the physical and chemical properties of fire.
4. Describe and apply the process of burning.
5. Define and use basic terms and concepts associated with the chemistry and dynamics of fire.
6. Describe the dynamics of fire.
7. Discuss various materials and their relationship to fires as fuel.
8. Demonstrate knowledge of the characteristics of water as a fire suppression agent.
9. Articulate other suppression agents and strategies.
10. Compare other methods and techniques of fire extinguishments.
11. Identify and analyze the major causes involved in line of duty firefighter deaths related to structural and wildland firefighting, training and research and the reduction of emergency risks and accidents.
IV. Course Content

1. Introduction
   a. Matter and Energy
   b. The Atom and its Parts
   c. Chemical Symbols
   d. Molecules
   e. Energy and Work
   f. Forms of Energy
   g. Transformation of Energy
   h. Laws of Energy

2. Units of Measurements
   a. International (SI) Systems of Measurement
   b. English Units of Measurement

3. Chemical Reactions
   A. Physical States of Matter
   b. Compounds and Mixtures
   c. Solutions and Solvents
   d. Process of Reactions

4. Fire and the Physical World
   a. Characteristics of Fire
   b. Characteristics of Solids
   c. Characteristics of Liquids
   d. Characteristics of Gases

5. Heat and its Effects
   a. Production and Measurement of Heat
   b. Different Kinds of Heat

6. Properties of Solids Materials
   a. Common Combustible Solids
   b. Plastic and Polymers
   c. Combustible Metals
   d. Combustible Dust

7. Common Flammable Liquids and Gases
   A. General Properties of Gases
   b. The Gas Laws
   c. Classification of Gases
   d. Compressed Gases

8. Fire Behavior
   a. Stages of Fire
   b. Fire Phenomena
      1. Flashover
      2. Backdraft
      3. Rollover
      4. Flameover
   c. Fire Plumes

9. Fire Extinguishment
   a. The Combustion Process
   b. The Character of Flame
   c. Fire Extinguishment

10. Extinguishing Agents
    a. Water
    b. Foams and Wetting Agents
c. Inert Gas Extinguishing Agents  
D. Halogenated Extinguishing Agents  
e. Dry Chemical Extinguishing Agents  
f. Dry Powder Extinguishing Agents

11. Hazards by Classification Types  
a. Hazards of Explosives  
b. Hazards of Compressed and Liquefied Gases  
c. Hazards of Flammable and Combustible Liquids  
d. Hazards of Flammable Solids  
e. Hazards of Oxidizing Agents  
f. Hazards of Poisons  
g. Hazards of Radioactive Substances  
h. Hazards of Corrosive

V. Assignments  
A. Appropriate Readings  
   Assigned textbook and handout material.
B. Writing Assignments  
   Chapter questions and written examinations.
C. Expected Outside Assignments  
   Reading assignments in textbook and handout material.
D. Specific Assignments that Demonstrate Critical Thinking  
   Analysis of the effect of the chemical process in relationship to different materials.

VI. Methods of Evaluation  
Traditional Classroom Evaluation  
The student will be evaluated on class participation, written assignments and a final examination.
Online Evaluation  
A variety of methods will be used, such as: research papers, asynchronous and synchronous discussions (chat/forum), exercises/assignments, online quizzes and exams, and postings to online website.

VII. Methods of Delivery  
Check those delivery methods for which, this course has been separately approved by the Curriculum/Academic Standards Committee.

☒ Traditional Classroom Delivery ☐ Correspondence Delivery
☐ Hybrid Delivery ☒ Online Delivery

Traditional Classroom Delivery  
Lecture, Demonstration, Discussion and Multi-media.

Online Delivery  
Delivery includes the following: online written lectures, forum-based discussions, exercises/assignments contained on website, adding extra resources and other media sources as appropriate.

VIII. Representative Texts and Supplies  
NFPA Handbook (CD-ROM licensing agreement available)  
Principles of Fire Behavior; James Quintiere, Thomson
Principles of Fire Protection Chemistry and Physics; Raymond Friedman, NFPA
Qualitative Fire Behavior; Floyd Nelson, Fire Protection Publications

IX. **Discipline/s Assignment**
   Fire Technology

X. **Course Status**
   Course Status: Active
   Original Approval Date: August 25, 2009
   Board Approval: September 8, 2009
   Revised By: Christopher Baker
   Curriculum/Academic Standards Committee Revision Date: 10/17/2017