

# 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, hybrid and correspondence delivery.

**Recommended Preparation:** Successful completion of ENGL105 or equivalent multiple measures placement.

Transferable to CSU

51 Hours Lecture , 102 expected outside of class hours, 153 Total Hours of Instruction

Scheduled: Fall (even)

### II. Coding Information

Repeatability: Not repeatable

Open Entry/Open Exit: NA

Grading Option: Graded

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.

#### Correspondence Evaluation

Same as traditional classroom with the exception of the desired use of proctored exams and exclusion of participation in classroom activities. Students will be expected to complete assignments and activities equivalent to traditional classroom assignments and activities. Written correspondence and a minimum of six opportunities for feedback will be utilized to maintain effective communication between instructor and student.

#### Hybrid Evaluation

A combination of traditional classroom and online evaluations will be used. Traditional Classroom: exercises/assignments, mixed format exams and research papers. Online: exercises/assignments, online quizzes and exams, essay forum postings, and chat rooms.

### 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.

**Correspondence Delivery**

Assigned readings, instructor-generated typed handouts, lecture materials, exercises and assignments equal to traditional classroom delivery. Written correspondence and a minimum of six opportunities for feedback will be utilized to maintain communication between student and instructor.

**Hybrid Delivery**

A combination of traditional classroom and online instruction will be utilized. 26 hours will be taught through traditional classroom delivery by the instructor and the other 25 hours will be instructed online through the technology platform adopted by the District. Traditional class instruction will consist of lecture, demonstration, and discussion. Online delivery will consist of 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**

**Gann, Richard; *Principles of Fire Behavior and Combustion*, 4<sup>th</sup> edition, Jones & Bartlett, ISBN 9781284136111 4<sup>th</sup> edition 2015**

**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: Dan Weaver

Curriculum/Academic Standards Committee Revision Date: 09/20/2022