

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 meets the National Fire Academy, Fire and Emergency Services Higher Education (FESHE) curriculum model for Fire Behavior and Combustion. This course has been approved for online, hybrid and correspondence delivery.

Diversity Statement

Our commitment to diversity requires that we strive to eliminate barriers to equity and that we act deliberately to create a safe and inclusive environment where individual and group differences are valued and leveraged for the growth and understanding as an educational community.

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

Additional Course Information:

Transfer Status: Transferable to CSU

Total Number of Hours by Instructional Method: 51 Hours Lecture, 102 expected outside of class hours, 153 Total Hours of Instruction

Scheduled: Fall (even)

II. Coding Information

Repeatability: Not repeatable

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. Students will be required to complete two hours of outside-of-class homework for each hour of lecture.
- 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 Evaluation

Term paper (topic choice, thesis statement, outline, bibliography, rough draft, final draft), homework, classroom discussion, essay, journals, lab demonstrations and activities, multiple choice

quizzes, and participation.

Correspondence Evaluation

Same as face to face 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 in-class 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

Quizzes and exams could be administered in person and/ or online. Students will be expected to complete online assignments and activities equivalent to in class assignments and activities for the online portion of the course. Electronic communication, both synchronous and asynchronous (chat/forum) will be evaluated for participation and to maintain effective communication between instructor and students.

Online Evaluation

A variety of methods will be used, such as: research papers, asynchronous and synchronous (chat/forum) discussions, online quizzes and exams, posting to online website and email communications using the districts approved learning management system

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, discussion, audio/visual aids, demonstration, group exercises, guest speakers, lab, individualized programs and other as needed.

Correspondence Delivery

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

Hybrid Delivery

A combination of traditional classroom and online instruction will be utilized. Each semester a minimum of 17 hours, or 1/3 of the instruction hours, will be taught face-to face by the instructor and the remaining hours will be instructed online through the technology platform adopted by the District. Traditional class instruction could consist of exercises/assignments, lectures, visual aids, practice exercises, exams and quizzes. Online delivery could consist of exercises/assignments, lecture posts, discussions, exams and quizzes, adding extra resources and other media sources as appropriate.

Online Delivery

A variety of methods will be used, such as: research papers, asynchronous and synchronous (chat/forum) discussions, online quizzes and exams, posting to online website and email communications using the districts approved learning management system.

VIII. Representative Texts and Supplies

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

IX. Course Status

1. Current Status: Active
2. Original Approval Date: August 25, 2009
3. Course Originator:
4. Board Approval Date: September 8, 2009
5. Chancellor's Office Approval Date:
6. Revised by: Dan Weaver
7. Curriculum/Academic Standards Committee Revision Date: 05/07/2024