Las Positas College
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Course Outline for FST 53

FIRE BEHAVIOR AND COMBUSTION

Effective: Fall

I. CATALOG DESCRIPTION:
FST 53 — FIRE BEHAVIOR AND COMBUSTION — 3.00 units

Theory and fundamentals of 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.

3.00 Units Lecture

Grading Methods:
Letter Grade

Discipline:

	MIN
Lecture Hours:	54.00
Total Hours:	54.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

A. Describe the basic laws differentiating matter and energy;
B. Explain basic terminology, definitions, and terms associated with basic fire chemistry;
C. Identify some of the basic chemical symbols used in chemical formula writing;
D. Explain the importance of the 3 physical properties of these physical states of matter;
E. Identify how physical forces caused by fire can affect the changes in the physical states of matter;
F. Identify the Department of Transportation warning placards and label system;
G. Describe the Department of Transportation Hazard Class System;
H. Identify various methods and techniques to the theory of fire extinguishment based on development of the flame plume;
I. List various types and mediums of extinguishing agents;
J. Compare and contrast flashover and backdraft in a compartment fire.

V. CONTENT:

A. Fire chemistry and physics introduction
   1. Matter and energy
   2. The atom and its parts
   3. Chemical symbols
   4. Molecules
   5. Energy and work
   6. Forms of energy
   7. Transformation of energy
   8. Laws of energy
B. Units of measurement
   1. International units of measurement
   2. English units of measurement
C. Chemical reactions
   1. Physical states of matter
   2. Compounds and mixtures
   3. Solutions and solvents
   4. Process of reactions
D. Fire and the physical world
   1. Characteristics of fire
   2. Characteristics of solids
   3. Characteristics of liquids
   4. Characteristics of gases
E. Heat and its effects
   1. Production and measurement of heat
   2. Different kinds of heat
   3. Methods of heat transfer
   4. Sources of heat

F. Properties of solid materials
    1. Common combustibles
    2. Plastics and polygons
    3. Combustible metals
    4. Combustible dusts
G. Common flammable liquids and gases
    1. Fire characteristics
    2. General properties of gases
    3. The gas laws
    4. Classification of gases
    5. Compressed gases
H. Hazards of chemicals
    1. Hazards of explosives
    2. Hazards of compressed gases
    3. Hazards of flammable liquids
    4. Hazards of flammable solids
    5. Hazards of oxidizing agents
    6. Hazards of poisons
    7. Hazards of radioactive substances
    8. Hazards of corrosives
I. Burning rate
    1. Factors
    2. Formulas
    3. Heat
    4. Energy release signatures
J. Fire Plumes
    1. Calculate flame height
    2. Estimate temperature above fire
    3. Behavior of flame plumes
    4. Buoyancy
K. Combustion products
    1. Nature and level
    2. Yield smoke
    3. Hazards
L. Compartment fires
    1. Fire development
    2. Flashover
    3. Fully developed fires
    4. Ventilation factors
    5. Fire induced flows
    6. Computation
M. Analytical applications
    1. Fire safety
    2. Fire investigation
N. Fire modeling

VI. METHODS OF INSTRUCTION:
A. **Lecture** -
B. **Discussion** -
C. **Student Presentations** -
D. Slides
E. Transparencies
F. Videos

VII. TYPICAL ASSIGNMENTS:
A. Special Assignments 1. Student presentation of common flammable liquid or gas 2. Essay regarding heat and its effects 3. Group presentation of fire and the physical world

VIII. EVALUATION:
A. **Methods**
    1. Exams/Tests
    2. Quizzes
    3. Projects
    4. Class Participation
B. **Frequency**

IX. TYPICAL TEXTS:
1. Quintiere, James *Principles of Fire Behavior.*, Delmar Publishers, 0.
2. Faraday, Michael *The Chemical History of a Candle.*, Cherokee Publishing Company, 0.
3. Firedman, Raymond *Principles of Fire Prevention Chemistry*., -, 0.
4. - *Essentials of Firefighting.* 4th ed., International Fire Service Training Association, Fire Protection Publications., 0.

X. OTHER MATERIALS REQUIRED OF STUDENTS: