Course Acronym:	FTEC
Course Number:	5
Descriptive Title:	Fire Behavior and Combustion
Division:	Health Sciences and Athletics
Department:	Fire and Emergency Technology
Course Disciplines:	Fire Technology
Catalog Description:	This course examines the theory and fundamentals of how and why fires start, spread and are controlled, as well as an in-depth study of fire chemistry and physics, fire characteristics of materials, extinguishing agents and fire control techniques.
Prerequisite:	
Co-requisite:	
Recommended Preparation:	Fire and Emergency Technology 1 and eligibility for English 1A
Enrollment Limitation:	
Hours Lecture (per week):	3
Hours Laboratory (per week):	0
Outside Study Hours:	6
Total Course Hours:	54
Course Units:	3
Grading Method:	Letter Grade only
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	Prior to July 1992
Transfer UC:	No
Effective Date:	
General Education: ECC	
Term:	
Other:	
CSU GE:	
Term:	
Other:	
IGETC:	

Term:	
Other:	
Student Learning Outcomes:	**SLO #1 Fire Behavior and Chemistry** After the course of instruction the student will be able to recognize the terms and concepts related to fire behavior and chemistry. **SLO #2 Physical States of Matter** The Student will be able to identify the 3 physical states of matter and their physical properties. **SLO #3 ICS System** The student will be able to identify the five basic sections of the ICS system.
Course Objectives:	1. Analyze the basic laws differentiating matter and energy. 2. Diagram basic terminology, definitions and phenomena of fire related chemistry. 3. Create a list using the basic symbols used in chemical formula writing as they relate to fire technology. 4. Explain the importance of the various physical properties of the three physical states of matter. 5. Debate how physical forces caused by fire can affect changes in the physical states of matter. 6. Compare and contrast the Department of Transportation Hazard warning placards and labeling systems. 7. Diagram the Department of Transportation Hazard Class system. 8. Categorize the various methods and techniques necessary to effect fire extinguishment. 9. Compare and contrast the four basic methods of fire extinguishment. 10. Compare and contrast desirable and undesirable characteristics of water as used in fire extinguishment. 11. Evaluate various emergency fire incidents and recommend correct methods and techniques to successfully contain and extinguish the fires. 12. Examine and diagram the Incident Command System (ICS) as it is used in a variety of emergency incidents.
Major Topics:	**I. OVERVIEW OF BASIC LAWS OF MATTER AND ENERGY (6 hours, lecture)** A. Matter and energy B. The atom and its parts C. Chemical symbols 1. Chemical equations 2. Periodic Chart 3. Atomic weights and mass 4. Molecules D. Energy and work E. Forms of energy 1. Sources of energy 2. Sources of ignition 3. Transformation of energy F. Laws of energy **II. UNITS OF MEASUREMENTS (4 hours, lecture)** A. International Systems of Measurement (ISI)

B. Units of measurement for mass, energy
C. United States customary units of measurement
1. Length
2. Size
3. Area
4. Volume
5. Weight
6. Flow rates
7. Pressure

III. CHEMICAL REACTIONS (4 hours, lecture)

A. Physical states of matter
B. Compounds and mixtures
C. Solutions and solvents
D. Process of reactions
1. Oxidation/reduction
2. Combustion
3. Exothermic/endothermic

IV. FIRE AND PHYSICAL WORLD (4 hours, lecture)

A. Characteristics of fire
B. Characteristics of solids
C. Characteristics of liquids
D. Characteristics of gases

V. HEAT AND ITS EFFECTS (4 hours, lecture)

A. Production and measurement of heat
B. Different kinds of heat
C. Heat of combustion
1. Heat of solution
2. Heat of vaporization
3. Specific heat

VI. PROPERTIES OF SOLID MATERIALS (4 hours, lecture)

A. Common combustible solids
B. Plastics and polymers
C. Combustible metals
D. Combustible dusts

VII. COMMON FLAMMABLE LIQUIDS AND GASES (4 hours, lecture)

A. Fire characteristics
B. General properties of gases
C. The gas laws
D. Classification of gases
E. Compressed gases

VIII. FIRE EXTINGUISHMENT (3 hours, lecture)

A. The combustion process
B. The character of flame
C. Fire extinguishment

IX. CLASSIFICATION OF FIRE AND EXTINGUISHING AGENTS (4 hours, lecture)

A. Classes of fires
B. Portable fire extinguishers
C. Water
D. Foams and their types
E. Concentrate proportioning systems
F. Foam generating systems

X. GAS AND HALON EXTINGUISHING AGENTS (3 hours, lecture)

A. Inert gas extinguishing agents

	B. Halogenated extinguishing agents C. Dry chemical extinguishing agents D. Dry power extinguishing agents **XI. DEPARTMENT OF TRANSPORTATION HAZARD CLASSES (4 hours, lecture)** A. Nine hazard classes B. Other regulated materials C. Other classifications of hazardous materials 1. Cryogenic materials 2. Etiological substances 3. Cancer-causing materials **XII. PLACARDING (3 hours, lecture)** A. Department of Transportation placards B. Special placard C. Dangerous placard D. Weight limitations E. Incompatible loads **XIII. INTRODUCTION TO LABELING (3 hours, lecture)** A. Department of Transportation labels B. Special labels C. Labels for Office of Radiation D. Measurement (ORM) materials E. National Fire Protection Association (NFPA) 704 Systems **XIV. HAZARDS OF CHEMICALS (4 hours, lecture)** A. Hazards of explosives B. Hazards of compressed and liquified 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 corrosives
Total Lecture Hours:	54
Total Laboratory Hours:	0
Total Hours:	54
Primary Method of Evaluation:	1) Substantial writing assignments
Typical Assignment Using Primary Method of Evaluation:	Research and write a two-page report which describes the manner in which physical forces caused by a given fire affect changes in the physical states of matter involved in the fire. Submit report to the instructor.
Critical Thinking Assignment 1:	Given a fire problem scenario, analyze and prepare a three-page written report which compares and contrasts the basic methods of fire extinguishment available and explain which method is the best choice to extinguish the fire. Submit report to the instructor.
Critical Thinking Assignment 2:	Given a simulated emergency incident involving an overturned tanker on fire, analyze and prepare a one-page written evaluation of the probable contents and their potential hazard(s) based on warning placards and make recommendations to mitigate the potential hazards. Submit evaluation to the instructor.
Other Evaluation Methods:	Class Performance, Completion, Essay Exams, Homework Problems, Matching Items, Multiple Choice, Other (specify), Quizzes, Term or Other Papers, Written Homework

Instructional Methods:	Field trips, Group Activities, Lecture, Multimedia presentations
If other:	
Work Outside of Class:	Answer questions, Observation of or participation in an activity related to course content (such as theatre event, museum, concert, debate, meeting), Problem solving activity, Required reading, Study, Written work (such as essay/composition/report/analysis/research)
If Other:	
Up-To-Date Representative Textbooks:	James Angle, FIRE FIGHTING STRATEGIES AND TACTICS, 4th ed., Jones & Bartlett Learning, 2020. (Discipline Standard)
Alternative Textbooks:	
Required Supplementary Readings:	
Other Required Materials:	Periodic Charts of the Elements Chart - "Hazardous Material Warning Placards Current Chart" Incident Command System (ICS) chart
Requisite:	
Category:	
Requisite course(s): List both prerequisites and corequisites in this box.	
Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).	
Requisite Skill:	
Requisite Skill and Matching Skill(s): Bold the requisite skill(s). If applicable	
Requisite course:	Fire and Emergency Technology1
Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).	**Knowledge of basic incident command.** FTEC 1 - Define firefighting strategy and tactics.
Requisite Skill:	Eligibility for English 1A
Requisite Skill and Matching skill(s): Bold the requisite skill. List the corresponding	**It is advised that students be able to read and effectively analyze college level texts, and be able to write a paper that persuasively proves an original thesis.** Ability to compose a college-level term paper that demonstrates application of the

course objective under each skill(s). If applicable	academic writing process. Ability to read comprehend textbooks and fire department manuals.
Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Craig Neumann
Date:	02/01/1988
Original Board Approval Date:	
Last Reviewed and/or Revised by:	Kevin Huben
Date:	10/09/2018
Last Board Approval Date:	12/19/2022