FT R154: FIRE BEHAVIOR AND PRINCIPLES OF COMBUSTION

Originator
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College
Oxnard College

Discipline (CB01A)
FT - Fire Technology

Course Number (CB01B)
R154

Course Title (CB02)
Fire Behavior and Principles of Combustion

Banner/Short Title
Fire Behavior/Prin Combustion

Credit Type
Credit

Start Term
Fall 2021

Catalog Course Description
This course covers the theory of how fires start, spread, and are controlled; the fundamentals of fire behavior in an open and closed environment; an in-depth study of fire chemistry and physics; burn characteristics of materials; and techniques for controlling fires through the use of a variety of proven and newly developed extinguishing agents.

Taxonomy of Programs (TOP) Code (CB03)
2133.00 - *Fire Technology

Course Credit Status (CB04)
D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)
B (Transferable to CSU only)

Course Basic Skills Status (CB08)
N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)
C - Clearly Occupational

Course Cooperative Work Experience Education Status (CB10)
N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)
Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)
N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)
Y - Not Applicable

Course Noncredit Category (CB22)
Y - Credit Course

Funding Agency Category (CB23)
Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)
1 - Program Applicable

General Education Status (CB25)
Y - Not Applicable

Support Course Status (CB26)
N - Course is not a support course

Field trips
Will not be required

Grading method
Letter Graded

Does this course require an instructional materials fee?
No

Repeatable for Credit
No

Is this course part of a family?
No

Units and Hours

Carnegie Unit Override
No

In-Class

Lecture
Minimum Contact/In-Class Lecture Hours
52.5
Maximum Contact/In-Class Lecture Hours
52.5

Activity

Laboratory

Total in-Class

Total in-Class
Total Minimum Contact/In-Class Hours
52.5
Total Maximum Contact/In-Class Hours
52.5

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class
Minimum Outside-of-Class Hours
105
Maximum Outside-of-Class Hours
105

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
157.5
Total Maximum Student Learning Hours
157.5

Minimum Units (CB07)
3
Maximum Units (CB06)
3

Prerequisites
FT R151 or concurrent enrollment

Entrance Skills

Entrance Skills
Students must posses a basic understanding of the basic components of fire and know the different types of common fire department fire fighting apparatus.

Prerequisite Course Objectives
FT R151-Analyze the basic components of fire as a chemical reaction, the major phases of fire, and the main factors that influence fire spread and fire behavior.
FT R151-Explain the types of common fire department fire fighting apparatus, equipment, and personal safety equipment used for fire fighting.

Requisite Justification

Requisite Type
Prerequisite

Requisite
FTR151

Requisite Description
Course in a sequence

Level of Scrutiny/Justification
Content review

Requisite Type
Concurrent

Requisite
FTR151

Requisite Description
Course in a sequence

Level of Scrutiny/Justification
Content review

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:
1	List the various classifications of hazardous materials.
2	Describe fire suppression agents and their properties.
3	Identify general characteristics of a hazardous material within its classification.

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	Identify the fundamental theories of fire behavior and combustion.
2	Explain basic terminology, definitions, and phenomena of chemistry.
3	Identify some of the basic chemical symbols used in chemical formula writing.
4	Explain the importance of the various physical properties of the three states of matter as they relate to fire.
5	Identify how physical forces caused by fire can affect the changes in the physical states of matter.
6	Identify the Department of Transportation warning placards and labeling systems.
7	Describe the Department of Transportation Hazard Class system.
8	Identify various methods and techniques of 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 protection.
11	Categorize the components of fire.
12	Describe and apply the process of burning.
13	Discuss various materials and their relationship to fires as fuel.
14	Articulate other suppression agents and strategies.
15	Describe the basic laws of differentiating matter and energy.

Course Content

Lecture/Course Content

1. Introduction to the Building Blocks of Our World
    a. Matter and energy
    b. Parts of the atom, atomic weight and mass
    c. Chemical symbols and the periodic chart
    d. Molecules
    e. Energy and work
        i. Sources of energy
        ii. Sources of ignition
    f. Transformation of energy
    g. Laws of energy
2. Units of Measure
    a. International (SI) systems of measurement
    b. English units for measurement
3. Chemical Reactions
    a. Physical states of matter
    b. Compounds and mixtures
    c. Solutions and solvents
    d. Exothermic and endothermic processes of reactions, combustion, oxidation/reduction

4. Fire Behavior
    a. Characteristics of fire
    b. Characteristics of solids
    c. Characteristics of liquids
    d. Characteristics of gases
5. Fire Behavior and Its Effects
    a. Production and measurement of heat
    b. Specific heat
    c. Heat of combustion, solution, and vaporization
6. Properties of Solid Materials
    a. Common combustible solids
    b. Plastic and polymer
    c. Combustible metals
    d. Combustible dust
7. Common Flammable Liquids and Gases
    a. Fire characteristics
    b. General properties of gases
    c. The gas laws
    d. Classification of gases
    e. Compressed gases
8. Fire Extinguishment
    a. The combustion process
    b. The character of flame
    c. Extinguishing the fire
9. Classification of Fire and Extinguishing Agents
    a. Water
    b. Portable fire extinguishers
    c. Foams and their types
    d. Concentrated proportioning
    e. Foam generating systems
10. Gas and Halon Extinguishing Agents
    a. Inert gas
    b. Halogenated agents
    c. Dry chemical
    d. Dry powder
11. Department of Transportation Hazardous Classes
    a. Eight hazard classes
    b. Other regulated materials
    c. Cryogenic materials, etiological substances, and cancer causing materials
12. Placarding
    a. Department of transportation (DOT)
    b. Special placarding
    c. Dangerous placarding
    d. Weight limitations
    e. Incompatible materials
13. Introduction to Labeling
    a. Department of transportation (DOT) labels
    b. Special labels
    c. Labels for other regulated materials (ORM)
14. Hazardous Materials
    a. Hazards of explosives
    b. Hazards of compressed and liquefied gases
    c. Hazards of flammable liquids
    d. Hazards of flammable solids
    e. Hazards of oxidizing agents
    f. Hazards of poisons
    g. Hazards of radioactive substances
    h. Hazards of corrosives

Laboratory or Activity Content
none

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):
Problem solving exercises
Written expression

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):
Essays
Film/video productions
Group projects
Individual projects
Oral analysis/critiques
Objective exams
Oral presentations
Problem-Solving Assignments
Problem-solving exams
Quizzes
Role playing
Reports/papers
Research papers
Simulations

Instructional Methodology

Specify the methods of instruction that may be employed in this course
Audio-visual presentations
Computer-aided presentations
Class activities
Class discussions
Distance Education
Demonstrations
Group discussions
Instructor-guided interpretation and analysis
Lecture
Role-playing

Describe specific examples of the methods the instructor will use:
1. Instructor will direct interactive instructional activities asking students to research different classifications of fires.
2. Instructor will present information on the different types of extinguishing agents for different classifications of fire.
3. Instructor will breakdown the Emergency Response Guidebook.
4. Instructor will present information on how to read smoke emanating from a structure.
5. Instructor will develop small group exercises in which the students will identify different types of conditions leading to flashover.
6. Instructor will lead guided and focused discussions on the history of significant fires and their impact on firefighting practices.

Representative Course Assignments

Writing Assignments
1. Homework assignments, covering all chapters in the textbook.
2. Term paper required on one of the chapter subjects.

Critical Thinking Assignments
1. Participate in small group discussions focusing on methods of FF egress in during flashover conditions.
2. Participate in online discussions concerning the different classifications of fire.
3. Participate in focus groups concerning the effectiveness of different extinguishing agents.
4. Participate in group activities and develop tactics for fires involving chemicals or hazardous materials.
5. Identify different types of hazardous materials placarding for buildings and transportation.

Reading Assignments

Assignments in Text, Handouts, and Professional Journals such as; Fire Engineering, Fire House, and National Fire Protection Association.

Other assignments (if applicable)

None

Outside Assignments

Representative Outside Assignments

1. Students are assigned one chapter to read each week from the assgined text.
2. Students take a weekly quiz on the assigned chapter.
3. A discussion board is created and students are required to post on it.
4. Related Youtube videos are assigned weekly in a discussion board and students are required to post on it.
5. Students watch a PowerPoint on Canvas Studio and are required to post comments on it.

Articulation

C-ID Descriptor Number

FIRE 140 X

Status

Approved

District General Education

A. Natural Sciences

B. Social and Behavioral Sciences

C. Humanities

D. Language and Rationality

E. Health and Physical Education/Kinesiology

F. Ethnic Studies/Gender Studies

Course is CSU transferable

Yes

CSU GE-Breadth

Area A: English Language Communication and Critical Thinking

Area B: Scientific Inquiry and Quantitative Reasoning

Area C: Arts and Humanities

Area D: Social Sciences

Area E: Lifelong Learning and Self-Development

CSU Graduation Requirement in U.S. History, Constitution and American Ideals:

IGETC

Area 1: English Communication

Area 2A: Mathematical Concepts & Quantitative Reasoning

Area 3: Arts and Humanities

Area 4: Social and Behavioral Sciences

Area 5: Physical and Biological Sciences

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals

Resource Type
Textbook

Description
James G. Quintiere (2017). *Principles of Fire Behavior* (2nd). Taylor and Francis.

Resource Type
Other Resource Type

Description
National Fire Protection Association Handbook, NFPA , Latest Edition.

Distance Education Addendum

Definitions

Distance Education Modalities
Hybrid (51%–99% online)
Hybrid (1%–50% online)
100% online

Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.
Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

Yes

Regular Effective/Substantive Contact

Hybrid (1%–50% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Students will post a discussion board topic such as the proper identification of smoke behavior conditions.

Hybrid (51%–99% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Students will post a discussion board topic such as the proper identification of smoke behavior conditions.
Synchronous Dialog (e.g., online chat)	Students will share their thoughts of the online lecture in an online chat with their classmates.

100% online Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Students will post a discussion board topic such as the proper identification of smoke behavior conditions.
Synchronous Dialog (e.g., online chat)	Students will share their thoughts of the online lecture in an online chat with their classmates.
Other DE (e.g., recorded lectures)	Students will meet online with Instructor via Zoom.

Examinations

Hybrid (1%–50% online) Modality

Online
On campus

Hybrid (51%–99% online) Modality

Online
On campus

Primary Minimum Qualification

FIRE TECHNOLOGY

Review and Approval Dates

Department Chair

05/20/2020

Dean

05/20/2020

Technical Review

08/26/2020

Curriculum Committee

08/26/2020

Curriculum Committee
11/25/2020

CCCCO
MM/DD/YYYY

Control Number
CCC000254516

DOE/accreditation approval date
MM/DD/YYYY