



National Fire Academy

N0655 – Advanced Science of Hazardous Materials/Weapons of Mass Destruction Response

Version: 1st Edition, 2nd Printing, October 2022

Quarter:

ACE Credit: In the upper division baccalaureate degree category, three semester hours in fire science, fire technology, or introduction to chemistry.

IACET Continuing Education Units: 4.3

Length of Course: 6 Days (43 hrs., 25 min. contact hours, Sunday – Friday)

Prerequisite: Yes

Curriculum: Hazardous Materials

Training Specialist: Dave Donohue

Instructor:

Instructor email/phone:

Classroom: J-

Meeting Time: 8 AM – 5 PM

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Course Description (Catalog)

N0655 – “Advanced Science of Hazardous Materials/Weapons of Mass Destruction Response.” This six-day course is designed to facilitate comprehension, analyzing and implementation of the facts and science given the circumstances associated with risk-based response/decision-making.

This scenario based course is intended to facilitate students gaining and sharing the knowledge, skills and abilities to effectively make and verbalize justifiable risk-based decisions and sharing those outcomes with others involved in the response decision making process.

Student Qualifications (Primary and Secondary Audience)

The audience for this course consists of hazardous materials technician-level responders and allied professionals seeking more in-depth knowledge and understanding of science that allows for risk-based, fact-oriented, legally justifiable response to hazardous materials and other response operations.

Course Scope (Goal)

The course goal is for students to analyze and evaluate the science component to implement a risk-based response at a hazardous materials/weapons of mass destruction (WMD) incident.

Course Objectives (Course Learning Outcomes – TLOs)

After successfully completing this course, you will be able to accomplish the following:

- Apply the fundamentals of hazardous materials/weapons of mass destruction (WMD) response.
- Evaluate classification technologies and their capabilities, applications and limitations.
- Evaluate the field identification technologies and their capabilities, applications and limitations.
- Apply the science component of a risk-based response process to actual and simulated hazardous materials/weapons of mass destruction (WMD) scenarios.

Course Delivery Method

The National Fire Academy (NFA) offers specialized training courses and advanced management programs of national impact in an academic classroom environment [on campus at the National Emergency Training Center \(NETC\) in Emmitsburg, Maryland](#). This classroom course is designed for the national level fire service officer from State and local fire service organizations. All course materials are designed for interactive classroom environments, in either paper notebook or electronic formats.

Course Schedule

The purpose of the course schedule is to give you, at a glance, the required preparation, activities, and evaluation components of your course.

DAY 1	DAY 2
Introduction	Unit 3: Capabilities, Applications and Limitations of Field Identification Technologies
<i>Break</i>	<i>Break</i>
Introduction (cont'd) Activity I.1: Data Analysis Process	Unit 3: Capabilities, Applications and Limitations of Field Identification Technologies (cont'd)
<i>Break</i>	<i>Break</i>
Unit 1: Fundamentals of Hazardous Materials/Weapons of Mass Destruction Response	Unit 3: Capabilities, Applications and Limitations of Field Identification Technologies (cont'd)
<i>Lunch Break</i>	<i>Lunch Break</i>
Unit 1: Fundamentals of Hazardous Materials/Weapons of Mass Destruction Response (cont'd) Unit 2: Capabilities, Applications and Limitations of Classification Technologies	Unit 3: Capabilities, Applications and Limitations of Field Identification Technologies (cont'd) Activity 3.1: Data Analysis — Identification
<i>Break</i>	<i>Break</i>
Unit 2: Capabilities, Applications and Limitations of Classification Technologies (cont'd) Activity 2.1: Data Analysis — Classification (Field Screening) Activity 2.2: Technology Presentation Assignments	Unit 3: Capabilities, Applications and Limitations of Field Identification Technologies (cont'd) Activity 3.1: Data Analysis — Identification (cont'd)

Day 2 Homework:
Read Appendix F: Utah Valley University
Final Report Jack Rabbit Project Sept. 30,
2017

Note: This schedule is subject to modification by the instructors and approved by the training specialist.

DAY 3	DAY 4
Unit 4: Application of Science	Unit 4: Application of Science (cont'd) Activity 4.2: Determine Response Actions — Gases/Vapors
<i>Break</i>	<i>Break</i>
Unit 4: Application of Science (cont'd)	Unit 4: Application of Science (cont'd) Activity 4.2: Determine Response Actions — Gases/Vapors (cont'd)
<i>Break</i>	<i>Break</i>
Unit 4: Application of Science (cont'd)	Unit 4: Application of Science (cont'd) Activity 4.2: Determine Response Actions — Gases/Vapors (cont'd)
<i>Lunch Break</i>	<i>Lunch Break</i>
Unit 4: Application of Science (cont'd) Activity 4.1: Determine Response Actions — Solids	Unit 4: Application of Science (cont'd) Activity 4.3: Determine Response Actions — Liquids
<i>Break</i>	<i>Break</i>
Unit 4: Application of Science (cont'd) Activity 4.1: Determine Response Actions — Solids (cont'd)	Unit 4: Application of Science (cont'd) Activity 4.3: Determine Response Actions — Liquids (cont'd) Activity 4.4: Determine Response Actions — Multiple Products

DAY 5	DAY 6
Unit 5: Final Assessment Activity 5.1: Clandestine Laboratory	Unit 5: Final Assessment (cont'd) Final Exam
<i>Break</i>	<i>Break</i>
Unit 5: Final Assessment (cont'd) Activity 5.1: Clandestine Laboratory (cont'd)	Unit 5: Final Assessment (cont'd) Activity 5.2: Technology Presentation
<i>Break</i>	<i>Break</i>
Unit 5: Final Assessment (cont'd) Activity 5.1: Clandestine Laboratory (cont'd)	Unit 5: Final Assessment (cont'd) Activity 5.2: Technology Presentation (cont'd)
<i>Lunch Break</i>	<i>Lunch Break</i>
Unit 5: Final Assessment (cont'd) Activity 5.1: Clandestine Laboratory (cont'd)	Unit 5: Final Assessment (cont'd) Activity 5.2: Technology Presentation (cont'd)
<i>Break</i>	<i>Break</i>
Unit 5: Final Assessment (cont'd) Activity 5.1: Clandestine Laboratory (cont'd)	Unit 5: Final Assessment (cont'd) Activity 5.2: Technology Presentation (cont'd) Graduation

Course Resources (Instructional Materials)

In order to be fully prepared, obtain a copy of the required textbooks and other instructional materials prior to the first day of class.

Required Readings

The student must complete required readings during the course to be able to thoughtfully participate in discussions and activities.

None.

Suggested Reading/Resources

Suggested readings and resources are not evaluated, but may enhance the student's understanding, serve as additional sources for citation and promote discussion of course material.

None.

Required Resources (Course Textbook)

Student Manual.

Supplemental Resources (Supplemental Course Textbook)

None.

Grading Methodology (Evaluation Procedures)

Learning outcomes will be measured through a three-part assessment strategy.

Part 1 is a graded group activity designed to assess the students' proficiency in applying the science component of a risk-based response process to simulated hazardous materials/WMD scenarios. This activity is worth 20 percent of the students' final grade. Groups will be graded on their briefing presentations and group cooperation. Grades will be determined using the Activity 5.1 Clandestine Laboratory Briefing Grading Rubric.

Part 2 is a written exam worth 60 percent of the students' grade.

Part 3 is a group presentation on a classification or identification technology designed to provide students with an opportunity to learn from one another and both present and be exposed to real-world examples of the technologies used in their field. This activity is worth 20 percent of the students' final grade. Groups will be graded on their technology presentations and group cooperation. Grades will be determined using the Activity 5.2 Technology Presentation Grading Rubric.

EXAMINATION ADMINISTRATION PROCEDURES

Students will be given exams at the end of the class, and only the instructor will grade the exams. While the exams are being graded by the instructor, students will be asked to complete end-of-course evaluations.

Exams are to be completed individually and not as a group or a group activity, unless specifically directed within the instructor guide for the specific course. Students should use pencils to complete answer sheets if bubble sheets and a scoring key overlay are being used.

There should only be one answer for any given question marked by the student. A question with multiple answers is considered incorrect. Please mark number of incorrect answers on completed exam sheets, record score (percentage), and mark the appropriate letter grade.

Transfer the letter grades to the corresponding student name on the course roster.

If a student does not obtain a passing grade on the first attempt, the instructor will provide remediation¹ prior to a retest. Students who do not pass the first exam will be allowed to take one retest of a new exam before departing from the class. A second failure will result in a grade of "F" being recorded on the grade roster.

Once all exams have been graded, instructors should review the exam as a group.

In the event of unusual events (storm, fire response, family emergency) or early departure, the host agency or state representative may be asked to proctor the exam at a later date. The instructor is responsible to notify the Training Specialist as soon as practical of the situation and name of person responsible for the exams and testing process.

Course Outline

Introduction

Objectives

None

Unit 1: Fundamentals of Hazardous Materials/Weapons of Mass Destruction Response

Objectives

Terminal Objective

The students will be able to:

- 1.1 Explain the fundamentals of hazardous materials/weapons of mass destruction (WMD) response.

Enabling Objectives

The students will be able to:

- 1.1 Explain risk-based response according to National Fire Protection Association (NFPA) 472, Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents.
- 1.2 Explain four components needed to complete an accurate risk assessment.
- 1.3 Discuss the implications of NFPA 472 and specific chapter sections related to chemical analysis risk assessment and the use of specific technologies at a hazardous materials/WMD incident.
- 1.4 Describe the impact of a material's physical state.
- 1.5 Explain the difference between evidentiary and public safety sampling.
- 1.6 Recommend at least three database resources used to support information at a hazardous materials/WMD incident.

Unit 2: Capabilities, Applications and Limitations of Classification Technologies

Objectives

Terminal Objective

The students will be able to:

- 2.1 Evaluate classification technologies and their capabilities, applications and limitations.

Enabling Objectives

The students will be able to:

- 2.1 Evaluate at least six classification technologies and their capabilities, applications and limitations.
- 2.2 Apply classification technologies to a given hazardous materials/weapons of mass destruction (WMD) scenario.

Unit 3: Capabilities, Applications and Limitations of Field Identification Technologies

Objectives

Terminal Objective

The students will be able to:

- 3.1 Evaluate the field identification technologies and their capabilities, applications and limitations.

Enabling Objectives

The students will be able to:

- 3.1 Evaluate field identification technologies and their capabilities, applications and limitations.
- 3.2 Given hazardous materials/weapons of mass destruction (WMD) scenarios, contrast field identification technologies.

Unit 4: Application of Science

Objectives

Terminal Objective

The students will be able to:

- 4.1 Compare the science component of a risk-based response process to actual and simulated hazardous materials/weapons of mass destruction (WMD) scenarios.

Enabling Objectives

The students will be able to:

- 4.1 Assess the impact of the science component of a risk-based response on personal protective equipment (PPE), decontamination, protective actions and site control.
- 4.2 Evaluate a material's state of matter and determine whether it is a chemical, biological or radiological hazard.
- 4.3 Assess the technologies used in determining the hazards of a given material.
- 4.4 Appraise that data supplied by the technology aligns with the predicted hazard.

- 4.5 Analyze the facts and circumstances of a hazardous materials/WMD scenario for alignment with the science.

Unit 5: Final Assessment

Objectives

Terminal Objective

The students will be able to:

- 5.1 Given a simulated hazardous materials/weapons of mass destruction (WMD) scenario, construct the science and research component of a risk-based response.

Enabling Objectives

The students will be able to:

- 5.1 Defend response decisions when using the risk-based response process.
- 5.2 Summarize a given hazardous materials/WMD scenario through a briefing to multiagency, multidiscipline decision-makers.
- 5.3 Express technical information to a nontechnical audience.

Policies

Class Attendance and Cancellation Policy

Attendance

- You are required to attend all sessions of the course. If you do not, you may not receive a certificate, and your stipend may be denied.
- If you need to depart the training facility early and miss any portion of the course, you must make the request in writing to the sponsoring agency (e.g., State training director, etc.). The State training director may waive the attendance requirement in order to accommodate you with extraordinary circumstances as long as you complete all course requirements.

Course Failure

You can reapply for the failed course or any other NFA course and go through the random selection process. You don't have to successfully complete the failed course before attending another NFA course.

Student Code of Conduct Policy

Students, instructors and staff are expected to treat each other with respect at all times. Inappropriate behavior will not be tolerated.

Writing Expectations

Student writing will conform to the generally accepted academic standards for college papers. Papers will reflect the original work of the student and give appropriate credit through citations for ideas belonging to other authors, publications or organizations. Student written work should be free of grammatical and syntax errors, free of profanity or obscene language or ideas, and reflect critical thinking related to the course subject matter.

Citation and Reference Style

Attention Please: Students will follow the APA, Sixth Edition as the sole citation and reference style used in written work submitted as part of coursework to NFA. Assignments completed in a narrative essay, composition format, abstract, and discussion posts must follow the citation style cited in the APA, Sixth Edition.

Late Assignments

Students are expected to submit classroom assignments by the posted due date (11:59 p.m. EDT/EST) and to complete the course according to the published class schedule. As adults, students, and working professionals, you must manage competing demands on your time. Discussion board postings submitted within 3 days after the submission deadline will receive up to a 20% deduction. Those that do not submit their discussion board postings within this timeline will receive a "0" grade for the week. Final assignment papers will not be accepted after the deadline. Any paper submitted after the deadline will receive a "0" grade for that assignment.

Disclaimer Statement

Course content may vary from the outline to meet the needs of this particular group.

Grading

Please review the following rubrics that explain how grades will be awarded.

Students who do not complete the entire course will be awarded an Incomplete (I) grade. In accordance with National Fire Academy academic policies, an Incomplete (I) grade must be

removed by the end of the next semester following the course, or it automatically becomes a Failing (F) grade.

If you fail an on-campus course, you will not be issued a stipend for that course. You can reapply for the failed course or any other NFA course and go through the random selection process. You don't have to successfully complete the failed course before attending another NFA course.

http://www.usfa.fema.gov/training/nfa/admissions/student_policies.html

Academic Honesty

Students are expected to exhibit exemplary ethical behavior and conduct as part of the NFA community and society as a whole. Acts of academic dishonesty including cheating, plagiarism, deliberate falsification, and other unethical behaviors will not be tolerated.

Students are expected to report academic misconduct when they witness a violation. All cases of academic misconduct shall be reported by the instructor to the Training Specialist.

If a student is found to have engaged in misconduct and the allegations are upheld, the penalties may include, but are not limited to one or a combination of the following:

- expulsion,
- withholding of stipend or forfeiture of stipend paid,
- exclusion from future classes for a specified period; depending on the severity it could range from 1-10 years, and/or
- forfeiture of certificate for course(s) enrolled in at NETC.

Refer to NFA-specific Standard Operating Procedure 700.1 – *Academic Code of Conduct and Ethics* for more information.

GRADING RUBRICS

ACTIVITY 5.1

Clandestine Laboratory Briefing Score Sheet

(20 points)

Use the rubric on the following page to evaluate each group's presentation.

Group Number: _____

Group Members:

Total points: /20

ACTIVITY 5.1

Clandestine Laboratory Briefing Grading Rubric

Briefing	Poor (3 points)	Fair (6 points)	Good (9 points)	Excellent (12 points)	Points
<p>Did the group present a clear, concise and accurate briefing of their data analysis and determinations?</p> <p>Could group members answer questions posed by the instructors?</p>	<p>Briefing was not clear. Information was not well organized. Group members were unable to answer questions.</p>	<p>Information was somewhat organized, but contained some inaccuracies, exaggerations or excessive technical jargon, making details of the briefing inaccessible to their audience. Group members were able to answer some questions when asked by instructor(s) or other students.</p>	<p>Information was very well organized. Group members were able to answer most questions posed by instructor(s) and other students.</p>	<p>Briefing was of professional caliber. Information was extremely organized and easy to follow. Group members were able to answer all questions from instructor(s) and other students and justify their answers.</p>	/12 pts
Group Collaboration	Poor (2 points)	Fair (4 points)	Good (6 points)	Excellent (8 points)	Points
<p>Did group members contribute equally? Did group members effectively collaborate to achieve group objectives?</p>	<p>One or two members of the group did all the work. Some refused to participate or were not allowed to help.</p>	<p>One or two members of the group did not help complete tasks. Group was constantly covering for group members or not encouraging them to participate. Most members presented.</p>	<p>All group members worked on their own assignments. No one did more work than anyone else. Some communication, but mostly worked separately. All members presented.</p>	<p>All group members worked on their assignments, but also collaborated frequently. Clear connection and communication between the group members. All members presented.</p>	/8 pts
Total Points					/20 pts

ACTIVITY 5.2

Technology Presentation Score Sheet

(20 points)

Use the rubric on the following page to evaluate each group's technology presentation.

Group Number: _____

Group Members:

Total points: _____/20

ACTIVITY 5.2

Technology Presentation Grading Rubric

Briefing	Poor (3 points)	Fair (6 points)	Good (9 points)	Excellent (12 points)	Points
<p>Did the group present a clear, concise and accurate summary of the specified technology, including its capabilities, applications and limitations?</p> <p>Could group members answer questions posed by their audience regarding the specified technology?</p>	<p>Presentation was not clear. Information was not well organized. Group members were unable to answer questions.</p>	<p>Information was somewhat organized, but contained some inaccuracies, exaggerations or excessive technical jargon, making details of the presentation inaccessible to their audience. Group members were able to answer some questions when asked by instructor(s) or other students.</p>	<p>Information was very well organized. Group members were able to answer most questions posed by instructor(s) and other students.</p>	<p>Presentation was of professional caliber. Information was extremely organized and easy to follow. Each individual group member was able to answer all questions from instructor(s) and other students and to justify their answers.</p>	/12 pts
Group Collaboration	Poor (2 points)	Fair (4 points)	Good (6 points)	Excellent (8 points)	Points
<p>Did group members contribute equally? Did group members effectively collaborate to achieve group objectives?</p>	<p>One or two members of the group did all the work. Some refused to participate or were not allowed to help.</p>	<p>One or two members of the group did not help complete tasks. Group was constantly covering for group members or not encouraging them to participate. Most members presented.</p>	<p>All group members worked on their own assignments. No one did more work than anyone else. Some communication, but mostly worked separately. All members presented.</p>	<p>All group members worked on their assignments, but also collaborated frequently. Clear connection and communication between the group members. All members presented.</p>	/8 pts
Total Points					/20 pts