



THE
UNIVERSITY
of RHODE ISLAND

Center of Excellence for Explosives Detection, Mitigation and Response

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Fundamentals of Explosives 3 days

Basic Definitions and Principles
Chemistry – Conventional Explosives
Chemistry – Unconventional Explosives
Explosive Safety
Shock-wave Physics
Detonation Physics: theory and phenomena
Initiation of Detonation: initiation criteria, hot spots, shock, DDT
Explosive Devices and Applications
Explosive Effects

OVERALL OBJECTIVES:

This course is intended to help each student understand basic behaviors of explosives, how they detonate, and the effects of detonation. It provides a foundation for study of specific aspects of explosives work, from safety in handling and testing, to logistical, research, development, design and analysis functions. It provides terminology that describes these things so that personnel may discuss their work with a common point of reference.

LEARNING OBJECTIVES:

At course completion student should be able to:

- identify the main explosives in military use
- differentiate between primary and secondary explosives
- name three essential characteristics which make a material an explosive
- explain the differences between detonation and combustion
- explain the difference between an explosion and a detonation

- explain the concept of oxygen balance
- name the common industrial explosives
- name a few typical improvised explosive fillers
- describe the essential mechanical property of a material that allows a shock to form
- define a shock Hugoniot
- list mechanical states related to one another through conservation laws and shock-jump conditions
- define shock attenuation and why it occurs.
- describe the difference between a shock wave and a Chapman-Jouguet detonation
- explain the reason for detonation failure in small columns of explosives
- describe transient processes in shock initiation of detonation in military explosives
- distinguish between high- vs. low-power devices, and detonating vs. deflagrating devices
- explain how shaped charges work
- give the mathematical definition and physical meaning of positive impulse in air blast

Because this class is fundamental and we usually find a wide variation in depth and type of backgrounds among students who enroll for this course, we plan to formally check student progress and proficiency only by use of an open-book final exam. Expectations of a student will depend on his/her degree level and professional position.

IMMEDIATE BENEFITS:

Each student who completes this course will gain an immediate set of peers who have had the same experience. That provides a group of resource persons whom any staff member may call and get help from, in solving unfamiliar problems. Networking among colleagues is especially important in a relatively narrow field such as explosives, and the instructors are a part of that peer group. The notes that belong to each class member are another important resource for completing their job assignments, and for discussions with professional colleagues about those assignments.