

Contact Information
Jimmie Oxley
Chemistry Department
University of Rhode Island
Kingston, RI 02881
joxley@chm.uri.edu

Dynamic Diagnostics 2 days, 2 instructors

Simple & complex measurements

TECHNIQUES: witness plates, make switches, detonation waveshaping,
Gas guns, piezo pressure gauges, multiple embedded gauges,
ultrahigh-speed framing & streak cameras, multiple embedded gauges,
Interferometry, pulsed radiography

APPLICATIONS: device performance, wave arrival times, pressure
Histories in solids and air, HE output, shock wave evolution for use with
Hydro codes, detonation spreading, shock-wave shapes within solids

OVERALL OBJECTIVES:

This course will consist of one day of lectures and one day of exercises, firing site visits, and experiment planning by each student. This course is intended to help each student understand the principal experimental techniques for measuring explosive behaviors spanning the range from basic tests that are available at any test site to more advanced techniques. Basic explosive firing-site operational safety, experiment planning and synchronization, experimental procedures and analysis of data will be discussed. At the end of this course the student will be familiar with the experimental techniques and capabilities and be able to plan and conduct experiments at Picatinny facilities, as well as understand test data and techniques presented by DOD contractors in presentations, proposals, and reports.

LEARNING OBJECTIVES:

At course completion, each student should be able to understand the following:

Why we do experiments

- types of experimental data that are required

- identify the types of measurements needed
- linkages across models, computer codes and experimental data
- distinctions in objectives between differential experiments to answer science questions versus integral experiments on system behavior and performance.

Low-cost test techniques (production tests, lot qualification, quick scoping tests)

- statistical test techniques for go/no-go testing
- trades between low-cost versus more informative experiments

Distinguish between time-of-arrival gauges and pressure gauges, including limitations

Photographic techniques

- how a streak camera works
- how a framing camera works

Interferometric techniques

- know the differences among the various interferometer techniques
- what are VISAR and Fabry-Perot interferometers ?
- what is Photonic Doppler Velocimetry (PDV) ?

Radiographic techniques

- flash x-rays (including proton radiography)
- film cassette recovery and data evaluation

Standard tests

- wedge tests (shock run distance to detonation)
- gap tests (shock sensitivity of an explosive material)
- other safety tests (drop-weight impact, electrostatic discharge , friction hazards)
- arena tests

Conducting experiments

- experimental test setup & planning
- test range firing systems
- basics of range safety (firing site operations and hazards)
- experiment time lines and check lists

Case studies of experiments, test methods, and project support

Because this class covers a wide variety of experimental techniques and procedures, and there may be 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 by the use of an oral presentation of an experimental plan based on case studies of real DOD and DOE projects. 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 understanding of experimental techniques and test procedures including range safety. He/she will be knowledgeable of differing experimental techniques, and know the pros and cons of each. He/she will understand the requirements for conducting experiments and resource planning. This should enable a better understanding of options and techniques for approaching each class member's job assignments and better interactions with DOD contractors on projects involving experiments and data. Networking among colleagues is especially important in a specialized field such as explosives, and the instructors are a part of that peer group. Notes that belong to each class member are another important resource for completing job assignments and for discussions with professional colleagues about their assignments.

INSTRUCTORS:

The instructors for this course will be Dr. James Kennedy of HERE, LLC, and Dr. Keith Thomas of Los Alamos National Laboratory (LANL). Dr. Kennedy has over 40 years of experience in explosives work including large-scale field work, analysis of explosive performance, gas-gun experiments, and development of detonators and small-scale test. Dr. Thomas has over 15 years of experience in diagnostic development and experimental detonation physics for the Air Force Research Laboratory and LANL. He has worked at numerous DOD, DOE and commercial explosive firing sites in both the US and the UK.