

Upcoming Classes for 2014

You can schedule a class at your facility. Call or email Dr. Oxley, 401-874-2103; joxley@chm.uri.edu
In 2014 the classes with dates below will be offered at Picatinny Arsenal Dover, NJ. The rest should be offered in 2015.

More complete descriptions can be found at <http://energetics.chm.uri.edu/?q=node/95>

BASIC COURSES level denoted as B = baccalaureate (bachelors), T = technician, G = graduate]

Ap 29-May 1 *Fundamentals of Explosives (B)*: overview of chemical and physical principles; military and commercial explosives; explosive output; shock waves, detonation and initiation; explosive devices; homemade explosives, IEDs, peroxides; explosive detection.

Feb 10-12 *Explosive Operations: Safety and Protocol (B and T)*: a walk through the safety manuals; explosive storage; relevant regulations; required testing; safe handling; history of explosive accidents.

ENERGETIC MATERIAL BEHAVIOR AND PERFORMANCE

Stability, Compatibility and Surveillance (B): thermal safety; analysis of thermal stability and compatibility; surveillance issues; cookoff – thermal explosion models.

Mar 11-12 *Propellants & Combustion (G)*: combustion of energetics – theory and experiments; flame spread and convective burning; flame spread in cracks; surface ignition; propulsion equations.

Apr 15-17 *Detonation & DDT (G)*: detonation models and phenomenology; detonation theory – math and thermodynamics; Detonation Shock Dynamics (DSD) model; deflagration-to-detonation (DDT) phenomenology and testing; DDT Theory and modeling.

May 20-22 *Explosive Systems Hazards (G)*: explosive behavior related to hazards; DDT phenomenology and testing; flame spread in damaged explosives; non-thermal ignition sources – mechanical shear, electrical case studies; initiation sources from ordnance; insensitive high explosives (IHEs).

Energetic Nanomaterials (G): combustion propagation in pyrotechnics; thermites and metastable interstitial compositions.

EXPLOSIVE APPLICATIONS AND EFFECTS

Jun 10-12 *Dynamic Diagnostics (B)*: Experiment time lines. *Measurement techniques*: witness plates, make switches, detonation waveshaping, gas guns, pressure gauges, embedded gauges, ultrahigh-speed framing & streak cameras, interferometry, pulsed radiography. *Applications*: device performance, wave arrival times, pressure histories in media, HE output, shock-wave evolution, detonation spreading.

Air Blast and Structural Response (B): blast wave from high explosives – scaling laws; blast from deflagration; themobarics; coupling to structures; stress & strain; single-degree-of-freedom system analysis; pressure-impulse failure estimates.

Jun 23-24 *Materials Response under Impulsive Loading (G)*: emphasizes inert material response to dynamic loads; detonation-driven shocks; material structure & mechanical behavior; dynamic response experiments; inelastic continuum mechanics & material damage; material response modeling & wave codes.

Explosive Components and Train Design (B): design approach; low-energy electroexplosive and laser-ignited devices; high-power detonators and arrays; slapper detonator (ESAD) technology; explosive train design & statistical reliability testing; hazards with devices and trains; manufacturing explosive devices.

Warhead Mechanics (B): shaped charges and jet penetration; Gurney model and combination with other physics; detonation wave interactions and effects on metal; fuzes, especially in-line electronic safing, arming & firing (ESADs).

May 6-8 *Pyrotechnics (B)*: general principles and chemistry of pyrotechnics; roles of pyrotechnics: heat, ignition, light, thrust; pyro devices; flares and luminosity;

EXPLOSIVES CHEMISTRY

Terrorism Issues (B): terrorist threats; peroxide explosive preparation, performance and safety; pre-blast detection of explosives; fragment hazards; performance codes by law enforcement; case studies.

July 8-9 *Environmental Issues with Explosives (B)*: general explosive issues and toxicity; explosive residue from blast; fate & transport of explosives in soil, water, plants; sampling protocols & analysis methods.

Laboratory Analysis and Forensics (B): review of actual protocols for explosive analysis, for specific explosives; operational safety; case studies from former forensic scientists.

Sept 9-11 *Material Characterization & Processing (B)*: characterization & effects of particle morphology; controlling particle morphology – recrystallization; formulation; particle-size effects of safety and performance; iRDX.

Explosive Synthesis (G): synthesis of common military explosives; new materials and preparations; advanced and high-nitrogen energetic materials.