University of Missouri nuclear proliferation, security and safeguards

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(*Speaker)

1970’s

- In the1970’s students and faculty engaged in research and public education on the topic of home made nuclear bomb syndrome.

1980's

- In the early 1980's the American Nuclear Society also engaged some of our faculty members for a public information questions and answers booklet on safety and risks.
- In the mid 80's our faculty held a well attended workshop on safety and risk analysis.

1990's

- Faculty worked with Russian Government to transition USSR weapons scientists to civilian non-military research
- Faculty worked with NATO to develop cooperative partnership workshops hosting the 1st in Minsk, Belaruss 1994 and the 4th in St. Petersburg Moscow
- Faculty involvement in ISTC as program managers
- Faculty worked on the development of a course on threats of nuclear and other WMD in terrorism

2000's

- Faculty taught course on the Science and Technology of Terrorism and Counterterrorism (STTC) that was first taught fall semester of 2000 and has been taught every year since in well populated classes.
- In 2002, STTC was introduced to MU direct, a web based learning program for off campus students and it has been taught every semester (fall, spring and summer) since.
- In spring semester of 2005 we taught a course Nonproliferation issues for Weapons of Mass Destruction NIWMD.
- In the summer of 2005 NIWMD was taught as part of the Innovations in Nuclear Infrastructure and Education Program (*Award No. DE FG07-03ID14531*) to 37 students from 13 states and 23 schools.
- NIWMD was then added as a web based MU direct course in the fall of 2005. The course has been taught since then every semester online as well as on the campus.
- In 2005, a course on nuclear materials safeguards was also added.
- In 2006 the University approved a graduate certificate in nuclear materials and safeguards.
- During the Spring semester of 2008 a new course on Nuclear Power Plant Systems and Security was taught and added to the curriculum.

Graduate Certificate in Nuclear Safeguards Science and Technology

- Certificate in Nuclear Safeguards Science and Technology approved March 2006
  - 4 required courses
    - NE 7001 Nuclear Safeguards Science and Technology
    - NE 7003 Radiation Safety
    - NE 7331 Nonproliferation Issue for WMDs
    - NE 7391 Radiation Detection

Undergraduate Minor in Homeland Security and Counterterrorism

- Minor Established April 2006
  - Courses
- ***Introduction to Terrorism and Counter Terrorism-3 credit hours***
  - The NSEI faculty, along with the several adjunct faculty from various departments across the campus, have been offering this course since Fall 2000. So far we have offered this course 9 times (F00, F01, W02, F02, W03, F03, W04, F05 and F06) at the MU campus, 3 times at the University of Missouri-Kansas campus (W04, F05 and F06) and 12 times with MU direct (W03, SS03, F03, W04, SS04, F04, W05, SS05, F05, W06, SS06 and F06). The lecture topics and the number of lectures corresponding to each topic are listed in Table II. We have started using our book "Science and Technology of Terrorism and Counter Terrorism" as the text for the class. Lecture topics for this class are:
    - Nature of Terrorism
    - Bioterrorism: Classification, Manufacture, Toxicity, Effectiveness, Control, Delivery, Counter Measures
    - Chemical Terrorism: Chemical Agents, Manufacture, Properties, Delivery, Advantages, Disadvantages, Counter Measures, Interaction on human system
    - Nuclear Terrorism: Motivation, Threats, Proliferation, Control, Radiation, Ionizing Radiation, principles of radioactivity, Decay, Population doses, biological effects of radiation. Nuclear waste transport, Implications for terrorist activities
    - Cyber Terrorism: Cyber Terrorism: Its nature and Scope, The Attack: Vulnerabilities and Consequences, Protection and Respon
    - Engineering Materials and Structures for Blast Loading
    - Agricultural Terrorism
    - Protective Clothing
    - Case Studies
    - *Treaties*

Courses Continued

- ***2. Nuclear, Biological and Chemical Detection Laboratory – 3 credit hours***
- Students will be required to conduct 8 to 10 experiments in the area of Aerosol, Nuclear, Biological and Chemical detection. A List of Experiments for NBC Detection Laboratory Course
- **Aerosol Section**
  - **Aerosol Detection**: Collection of bioaerosols using All Glass Impinger (AGI) and a six stage Andersen Impactor (AI) and the identification of microorganisms. Aerosol particle sizing using TSI SMPS.
  - **Nuclear Detecton**
  - **Chemical Detectors GC, LC, FTIR, Hand Held Analyzers, Enzyme Kits**
  - **Biological Section : Enzyme Kits, Use of Swabs, Biodetection Kits, Floy Cytometer, PCR**

Courses Continued

- ***3. Risk Analysis, Disaster, Emergency Management, and Preparedness – 3 credit hours***
  - Topics for Risk Analysis Disaster, Emergency Management, and Preparedness Course
    - Definition of risk
    - Risk Estimation and Data Interpretation and Management
    - Emergency Response To Terrorism: Basic Concepts
    - Emergency Response to Terrorism: Tactical Considerations — Company Officer
    - Emergency Response to Terrorism: Tactical Considerations — Emergency Medical Services
    - Emergency Response to Terrorism: Tactical Considerations — Hazardous Materials
    - Emergency Response to Terrorism: Violence in the Schools
    - Explosive Incident Response — Awareness
    - Hospital Decontamination — Fire Department Mutual Aid System
    - Radiological Incident Management
    - Weapons of Mass Destruction Detection and Decontamination

Continued

- ***4. Nonproliferation Issues for Weapons of Mass Destruction – 3 credit hours***
  - Non-Proliferation Issues for Weapons of Mass Destruction covers the nuclear fuel cycle, radioisotope production, the nuclear industry, nuclear proliferation risks, biological weapons, risks, biotech industry and the pharmaceutical industry; chemical weapon, risks and chemical industry; DIA threat analysis: Nuclear, Chemical and Biological, Proliferation threats: Chemical and Biological weapons; Dual use facilities; Treaties and the future of WMD in the changing world.

Continuted

- ***Nuclear Safeguards Science and Technology – 3 credit hours***
    - Nuclear materials management and safeguards, Physical protection, Material accounting and control, monitoring and regulatory issues, nuclear materials infrastructure, Surveillance; containment of nuclear materials.

Continued

- ***Radiation Detection - 3 credit hours***
  - Principles and application of radiation detectors and analyzers: ionization, Geiger-Muller, proportional, liquid and solid scintillation, semiconductor, pulse height analyzers, coincidence circuits, data reduction, tracer applications, activation analysis. Lectures, laboratory.

Continued

- ***Chemical and Biological Weapons – Manufacture, Threat, Management, and Detection – 3 credit hours***
  - Topics for Chemical and Biological Weapon Course
    - 1. Classification of agents
    - 2. Threat assessment and proliferation issues
    - 3. Manufacturing and Delivery procedure
    - 4. Protection from agents
    - 5. Inspection Procedure
    - 6. Warfare Vs. Terrorism
    - 7. International treaties and their Implication
    - 8. Detection of agents
    - 9. Protective Clothing
    - 10. Destruction of agents

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Continued

- ***. Particulate Systems Engineering (Aerosol Science) – 3 credit hours***
  - Description of aerosols, Particle motions, Particle size statistics, Brownian motion and diffusion, Radiometric forces, Size distribution and measurement, Dispersion, Deposition, Dose calculation.

Summary

- The Nuclear Science and Engineering Institute at the University of Missouri continues to be engaged in outreach to the nuclear community through its courses and workshops on nuclear proliferation, security, and safeguards issues and is continually looking to forge new partnerships.