



National Consortium for the
Study of Terrorism and Responses to Terrorism

A CENTER OF EXCELLENCE OF THE U.S. DEPARTMENT OF HOMELAND SECURITY BASED AT THE UNIVERSITY OF MARYLAND

UNIVERSITY OF MARYLAND

BSST 240

UNDERSTANDING THE PRINCIPLES AND PERILS OF CBRN WEAPONS

INSTRUCTORS:

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Course Logistics:

This course will meet from Aug 29 – Dec 8, 2017 on the following Schedule:

Lecture: TuTh 6pm - 7:15pm

Location: JMZ 3203

Course Description: This course will provide students with a basic, multidisciplinary natural science foundation in chemistry, biology, and physics by exploring the threat of Chemical, Biological, Radiological, and Nuclear (CBRN) weapons. In so doing, it will present a novel yet engaging introduction to scientific principles by examining them through the lens of what might be considered the “dark side” of science. In order to achieve an understanding of CBRN weapons, students must first learn about the scientific method, and certain fundamental principles of chemistry, biology, and physics. Students will also learn how to test hypotheses, use basic statistics, interpret results, and apply their new knowledge through discussions of practical applications in the domains of public health, emergency management, epidemiology, and threat assessment. Lectures will also introduce students to several complex issues surrounding scientific ethics and science and technology policy.

Learning Outcomes:

By the end of the course, student will have developed the ability to:

- Demonstrate a broad understanding of scientific principles and the ways scientists working at the intersection of biology, chemistry, physics, health sciences, social sciences, and public policy conduct research on CBRN weapons, test assumptions, and balance ethical and policy concerns that certain research can abut;
- Apply quantitative, mathematical analyses to science problems through empirical analysis and formal assessment of threat, risk, and consequence;
- Solve complex problems requiring the application of several different scientific concepts presented through both the interactions between harming agents and delivery mechanisms and the potential for reactions between the two;
- Look at complex questions and identify the science and how it impacts and is impacted by political, social, economic, or ethical dimensions through the consideration of weaponization of chemical and biological agents, policy implications for nuclear and radiological testing, and the policy and ethical concerns surrounding public health research and research into CBRN weapons;
- Critically evaluate scientific arguments and understand the limits of scientific knowledge when it comes to the capabilities of non-state actors’ development of functional CBRN weapons, and the risk of certain research developments, and the challenges to RN detection faced globally;
- Communicate scientific ideas, and the risks associated with some scientific ideas effectively through essay exams, a written report, and oral participation in class.

Grading and Assignments

Final grades are determined by the following:

- Mid-term Exam –30 % of your grade
- Final Report – 50% of your grade
- In-lecture Participation – 20% of your grade

Your grades for all assignments in the course will be numerical values. Numerical scores correspond to letter grades as follows:

A+	98-100	C	73-77
A	93-97	C-	70-72
A-	90-92	D+	68-69
B+	88-89	D	63-67
B	83-87	D-	60-62
B-	80-82	F	0-59
C+	78-79		

Class Policies:

Student Conduct and Academic Integrity. Students are expected to adhere to the University of Maryland's Code of Student Conduct and to treat each other with respect. Disruptive behavior of any kind will not be tolerated. Students who are unable to demonstrate civility with one another or with the instructor or teaching assistants, will be subject to referral to the Office of Student Conduct or to the Campus Police. The Code of Student Conduct is available online:
<http://www.president.umd.edu/policies/docs/v100b.pdf>.

Students are also expected to adhere to the University of Maryland's Code of Academic Integrity and to refrain from acts of academic dishonesty. All students must write the Student Honor Pledge on all assignments:

I pledge on my honor that I have not given or received any unauthorized assistance on this examination.

Any student committing an apparent act of academic dishonesty will be subject to referral to the Student Honor Council. The Code of Academic Integrity is available online:
<http://www.president.umd.edu/policies/docs/III-100A.pdf>.

Attendance. Regular attendance and participation in this class is the best way to grasp the concepts and principles being discussed. However, in the event that a class must be missed due to an illness, the policy in this class is as follows:

- For every medically necessary absence from class, a reasonable effort should be made to notify the instructor in advance of the class.
- If a student is absent more than one week (two consecutive course meetings), the student should supply documentation signed by a health care professional.
- If a student is absent on days when in-class simulations/activities are scheduled, he or she is required to notify the instructor in advance, and upon returning to class, bring documentation of the illness, signed by a health care professional. The student may be required to complete a make-up assignment.

Any student submitting falsified documentation of illness will be referred to the Student Honor Council.

Class Cancellation and Room Changes. This course follows the university policies on closures. If the University is closed, class will not convene. Make-up classes will be scheduled, if feasible, through consensus within the students in the course. If students are not able to attend a make-up class meeting due to other class commitments, they will be allowed to complete an assignment in order to earn the participation points, and gain exposure to the course materials.

If there are scheduling changes or relocations of class meetings, students will be notified at least 48-hours in advance and accommodations will be made.

Religious Observances. The University System of Maryland policy on religious observances provides that students should not be penalized because of observances of their religious beliefs; students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. Students must submit a written request to make up a class meeting, assignment, or exam date for the purposes of religious observance by the end of the second week of classes. Please note that accommodations will not be made for travel to and from the site of religious observances. Additional information on religious observance policy is available online: <http://www.engl-pw.umd.edu/PoliciesandProcedures/GeneralPolicies/ReligiousObservances.htm>.

Disability Support Services. Any student requesting special accommodations must be registered with the University of Maryland's Disability Support Service (DSS) Office and must provide a DSS Accommodation Form updated for the current semester by the end of the second week of classes. Students who fail to meet this deadline will not receive special accommodations. Additional information on disability support services is available online: <http://www.counseling.umd.edu/DSS>.

Course Schedule:

This course will meet from Aug 29 – Dec 8, 2017 on the following Schedule:

Lecture: Tu Th 6pm - 715pm

Location: JMZ 3203

Aug 29: Cory

- **Lecture:** Introduction to the syllabus/course

Aug 31: Cory

- **Lecture:** CBRN terrorism prelude and the scientific method
- **Readings:** Excerpts from Chalmers, A.F. 1999. *What Is This Thing Called Science?* Fourth edition. Berkshire, UK:Open University Press.
 - Chapters 1 – 7
 - Available as an e-book at UMD Libraries: http://umaryland.worldcat.org/title/what-is-this-thing-called-science/oclc/860712295&referer=brief_results

Sept 5: Gary

- **Lecture:** Sulfur to Sarin: The Basic Chemistry Underlying Chemical Weapons I
- **Readings:** An Introduction to Chemistry by Mark Bishop (http://preparatorychemistry.com/Bishop_Atoms_First.htm)
 - Chapters 3 and 5 (Chapters 1; 2; 4; 6 optional)
- Nuclear Threat Initiative: Chemical Weapon Terrorism Tutorial
 - <http://apps.start.umd.edu/NTI/cwtutorial/>
- Clark, Fiona, van Daalen, Hanspeter, Howland, Ioana, de Vries, Henk, and Juurlink, Ludo. 2013. "Chemistry in Conflict." In *Chemistry in Conflict*, 6–18. Organisation for the Prohibition of Chemical Weapons. <http://www.opcw.org/our-work/education-and-outreach/chemistry-in-conflict/>.
 - Chapter 1

Sept 7: Gary

- **Lecture:** Sulfur to Sarin: The Basic Chemistry Underlying Chemical Weapons II

Sept 12: Cory

- **Lecture:** The Biology Behind Bioviolence I: Bioagents
- **Readings:** Willey, Joanne M. 2014. *Prescott's Microbiology*. Ninth edition. New York, NY: McGraw-Hill.
 - Excerpts from Parts 1, 4, 5, 7 and 8
- United States Army Medical Research Institute of Infectious Diseases. 2011. *Medical Management of Biological Casualties Handbook*. Seventh Edition. Washington, DC: U.S. Government Printing Office.
<http://www.usamriid.army.mil/education/bluebookpdf/USAMRIID%20BlueBook%207th%20Edition%20-%20Sep%202011.pdf>
 - Introduction
 - History of Biological Warfare and Current Threat
 - Excerpts from Bacterial Agents: Anthrax, Plague, Tularemia
 - Excerpts from Viral Agents: Smallpox, Viral Hemorrhagic Fevers

- Excerpts from Biological Toxins: Botulinum, Ricin
- Nuclear Threat Initiative Biological Weapons Terrorism Tutorial
 - <http://apps.start.umd.edu/NTI/bwtutorial/>

Sept 14: Cory

- **Lecture:** The Biology Behind Bioviolence II: Biowarfare

Sept 19: Cory

- **Lecture:** The Biology Behind Bioviolence III: Bioterrorism
- **Readings:** Gigi Kwik Gronvall, *Synthetic Biology: Safety, Security, and Promise* (Baltimore: Health Security Press, 2016)
 - Chapters 1 & 2
- Bale, Jeffery, and Gary Ackerman. "Recommendations on the Development of Methodologies and Attributes for Assessing Terrorist Threats of WMD Terrorism." *Report prepared for Los Alamos National Laboratory* (2004).
- <https://www.fbi.gov/history/famous-cases/amerithrax-or-anthrax-investigation>

Sept 21: Cory

- **Lecture:** The Biology Behind Bioviolence IV: Synthetic Biology

Sept 26: Steve

- **Lecture:** Unlocking the Power of the Atom: Ionizing Radiation and Nuclear Fission/Fusion and The Science of Weapon Delivery I
- **Readings:** United States, and United States. 1993. *Technologies Underlying Weapons of Mass Destruction*. Background Paper. Washington, DC: Office of Technology Assessment, U.S. Congress : Supt. of Docs., U.S. G.P.O., distributor. Available from: <http://www.fas.org/spp/starwars/ota/9344.html>,
 - Chapter 5
- Cooper, Paul, and Stanley R. Kurowski. 1996. *Introduction to the Technology of Explosives*. Wiley.
 - Chapter 1
- Seinfeld, John H. 1998. *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*. New York: Wiley.
 - Chapter 9
- Kirkpatrick, Larry D. 2010. *Physics: A Conceptual World View*. 7th ed. Belmont, CA: Brooks/Cole Cengage Learning.
 - Chapters 11, 25 and 26
- Nuclear Threat Initiative Nuclear Terrorism Tutorial
 - <http://apps.start.umd.edu/NTI/nuctutorial/>
- Nuclear Threat Initiative Radiological Terrorism Tutorial
 - <http://apps.start.umd.edu/NTI/radtutorial/>
- *NATO Handbook on the Medical Aspects of NBC Defensive Operations*. 1996. Washington, DC: Departments of the Army, Navy, and Air Force. Available from: <http://www.fas.org/nuke/guide/usa/doctrine/dod/fm8-9/1toc.htm>
 - Part I: Chapters 2-5
- Serber, Robert. 1943. *The Los Alamos primer: the first lectures on how to build an atomic bomb*. Available from: http://upload.wikimedia.org/wikipedia/commons/9/9c/Los_Alamos_Primer.pdf

Sept 28: Steve

- **Lecture:** Unlocking the Power of the Atom: Ionizing Radiation and Nuclear Fission/Fusion and The Science of Weapon Delivery II

Oct 3: Cory

- **Lecture:** The Threat of CBRN Weapons I
- **Readings:** Cirincione, Joseph, Wolfsthal, Jon, and Rajumkar, Miriam. 2005. *Deadly Arsenals: Nuclear, Biological, and Chemical Threats*. Second edition. Washington, DC: Carnegie Endowment for International Peace.
 - Chapter 1
- Bale, Jeffrey M. and Ackerman, Gary A. 2009. "Profiling the WMD Terrorist Threat," in Stephen M. Maurer (ed.), *WMD Terrorism: Science and Policy Choices*. Cambridge, MA: MIT Press.

Oct 5: Cory

- **Lecture:** The Threat of CBRN Weapons II

Oct 10: Steve

- **Lecture:** Consequence Assessment and Emergency Management of CBRN Events I
- **Readings:** Maurer, Stephen M., ed. 2009. *WMD Terrorism: Science and Policy Choices*. Cambridge, Mass: MIT Press.
 - Chapters 11, 12, 13
- Veenema, Tener Goodwin, ed. 2013. *Disaster Nursing and Emergency Preparedness for Chemical, Biological, and Radiological Terrorism and Other Hazards*. 3rd ed. New York: Springer Pub. Co.
 - Section V

Oct 12: Steve

- **Lecture:** Consequence Assessment and Emergency Management of CBRN Events II

Oct 17: Steve

- **Lecture:** Midterm Review

Oct 19: Steve

- **Lecture:** Midterm Exam

Oct 24: Gary

- **Lecture:** The Frontiers of Science I: Emerging Technologies as Adversary Facilitators
- **Readings:** Zilinskas, Raymond and Dando, Malcom, "Biotechnology and Bioterrorism," in Katz, Rebecca, and Raymond A. Zilinskas, eds. 2011. *Encyclopedia of Bioterrorism Defense*. Hoboken, N.J: Wiley-Blackwell.
- Forest, James J. F., and Russell D. Howard. 2013. *Weapons of Mass Destruction and Terrorism*. New York, NY: McGraw Hill.
 - pp. 198-211
 - pp. 499-511
- Ranstorp, Magnus, and Magnus Normark, eds. 2009. *Unconventional Weapons and International Terrorism: Challenges and New Approaches*. Political Violence. London ; New York: Routledge.

- pp. 67-94
- Nguyen, T. H. 2005. "SECURITY: Microchallenges of Chemical Weapons Proliferation." *Science* 309 (5737): 1021–1021. doi:10.1126/science.1112445.
 - pp. 1021
- Flaherty, Joseph. 2012. "Looks Could Kill: Using 3-D Printers to Design Guns." *WIRED*, August 10. Available at: <http://www.wired.com/2012/08/rapid-fire-rapid-prototypes/>.

Oct 26: Gary

- **Lecture:** The Frontiers of Science II: Emerging Technologies and CBRN Countermeasures

Oct 31: Steve

- **Lecture:** Understanding CBRN Threat Through Quantitative Inference I
- **Readings:** Resendes, Keith. 2013. *Excelling With Data: Descriptive Statistics Using Microsoft Excel*. CreateSpace Independent Publishing Platform.

Nov 2: Steve

- **Lecture:** Understanding CBRN Threat Through Quantitative Inference II

Nov 7: Cory

- **Lecture:** Public Health
- **Readings:** Riegelman, Richard K. 2015. *Public Health 101: Healthy People--Healthy Populations*. Second edition. Burlington, MA: Jones & Bartlett Learning.
 - Chapters 1, 2, 3, 7, 8

Nov 9: Cory

- **Lecture:** Epidemiology
- **Readings:** Lilienfeld, David E. 1994. *Foundations of Epidemiology*. 3rd ed. New York: Oxford University Press.
 - Part I: Introduction to Epidemiology, Chapters 1 – 3
 - Additional Excerpts

Nov 14: Gary

- **Lecture:** Vulnerability Assessment and Ethical and Political Context of CBRN Weapons I
- **Readings:** Excerpts from Maurer, Stephen M., ed. 2009. *WMD Terrorism: Science and Policy Choices*. Cambridge, Mass: MIT Press.
- Excerpts from Hashmi, Sohail H., and Steven Lee, eds. 2004. *Ethics and Weapons of Mass Destruction: Religious and Secular Perspectives*. The Ethikon Series in Comparative Ethics. Cambridge, UK : New York: Cambridge University Press.
- TBD

Nov 16: Gary

- **Lecture:** Vulnerability Assessment and Ethical and Political Context of CBRN Weapons II

Nov 21: Steve

- **Lecture:** Assessing rare events
- **Readings:** TBD

Nov 23:

- **NO CLASS (THANKSGIVING BREAK)**

Nov 28: Gary

- **Lecture:** Threat and Risk Assessments I
- **Readings:** Rand Corporation. 2005. *Estimating Terrorism Risk*. Edited by Henry H. Willis. Santa Monica, CA: RAND. Available from:
http://www.rand.org/content/dam/rand/pubs/monographs/2005/RAND_MG388.pdf. Pages i-20.
- TBD

Nov 30: Gary

- **Lecture:** Threat and Risk Assessments II

Dec 5: Steve

- **Final Exam Review**

Dec 7: Steve

- **Final Exam Review**

Dec 13-19: Steve

- **Final Exam: TBD**

SAMPLE