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Course Description:

The Security Science course covers the design and evaluation of security systems for nuclear and radiological materials as well as other high value facilities. The course will introduce students to the concept of design basis threat (DBT) and its characterization followed by the importance of a physical protection system (PPS). This PPS is deployed to secure nuclear, radiological, and other high value materials at a facility or in transit against the State defined threats. The three elements of the PPS are detection, delay, and response. Students will be educated on these elements and their role in the implementation. Moreover, the PPS design will be examined to estimate risks against possible attacks. The types of attack will be characterized, and insider threat analysis will be performed to assess the PPS vulnerabilities. This system analysis will help to minimize the risk and optimize the system based on the DBT.

Course Objective:

This course will educate students on the topic of security systems, with an emphasis on design and evaluation of nuclear facilities. Students after taking the course will be able to design and evaluate security systems to deter, detect, delay, and respond to threats for securing nuclear, radiological and other high value materials.

This course will allow student to:

1. Review the major nuclear security programs sponsored by international bodies, non-governmental organizations, and industry.
2. Comprehend the types of adversaries (terrorists, criminal groups, protesters, etc.) and characterize a DBT for a particular facility based on the State's threat-informed security evaluation.
3. Recognize the possible scenarios that a malicious adversary/adversaries may pursue while accounting for potential technologies that they may possess.
4. Understand the three elements of the PPS, detection, delay, and response, while underlining the importance of deterrence realized through the PPS and any other means.
5. Incorporate the insider threat in a DBT and perform a comprehensive threat analysis to evaluate the PPS employed at a facility.
6. Characterize nuclear and radiological materials and perform the risk-assessment for a facility that will be threat-informed.

7. Optimize the PPS to minimize the risk of sabotage or theft to a facility to an acceptable level.
8. Assess the importance of personal attitude toward security and recognize all stakeholders in a security regime and the significance of collaboration.

Meeting Times and Place:

Monday and Wednesday 5:00 pm – 6:15, Engineering Building West 106

Prerequisite:

None

Office Hours:

Available anytime I am in my office or email to set up an appointment.

Required Textbook:

The Design and Evaluation of Physical Protection Systems, Mary L. Garcia, 2nd Edition, Butterworth-Heinemann (2007)

- The 1st Edition is also acceptable

Reference Material:

1. Sandia National Laboratories, "Intrusion Detection Systems Handbook", SAND76-0554, 1976.
2. *Nuclear Safeguards, Security, and Nonproliferation: Achieving Security with Technology and Policy*, James E. Doyle, Butterworth-Heinemann (2008), 0-7506-8673-1.
3. International Atomic Energy Agency, "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities", INFCIRC/225/Rev. 5, 2011, http://www-pub.iaea.org/MTCD/publications/PDF/Pub1481_web.pdf.
4. International Atomic Energy Agency, "Education and Training in Nuclear Security", <http://www-ns.iaea.org/security/training.asp?s=9&l=76>.
5. Nuclear Security Science and Policy Institute, "Nuclear Security & Safeguards Education Portal", <http://nsspi.tamu.edu/nssep/courses?category=244>.

Assessment:

Homework: 30%

Exam 1: 20%

Exam 2: 20%

Final Exam: 30%

Teaching Assistant: Ahmed Azzawi

Office: Engineering East, TBD

Course schedule:

Topic	Date	Reading	Due
Introduction to Nuclear Security	14-Jan	Ch. 1	
Design and Evaluation Process and Target identification	16-Jan	Ch. 4	
No class – MLK day	21-Jan		
Design Basis Threat	23-Jan	Ch. 3	
Guest lecture – Threat Characteristics	28-Jan		
Insider Threat	30-Jan		HW 1
Guest lecture – Security Culture	4-Feb		
Guest lecture – Terrorism	6-Feb		HW 2
Guest lecture – ISIS	11-Feb		
PPS Objectives	13-Feb	Ch. 5	
Facility Characterization	18-Feb	Ch. 2	Exam 1
Intrusion Detection Exterior and Interior Sensors	20-Feb	Ch. 6, 7	
Access Control	25-Feb	Ch. 10	
Contraband Detection	27-Feb	Ch. 10	HW 3
No class – VCU Spring Break	4-Mar		
No class – VCU Spring Break	6-Mar		
Access Delay	11-Mar	Ch. 11	
Response	13-Mar		
Scenario Development	18-Mar	Ch. 8, 9, 12	
Transportation Security	20-Mar		
Adversary Path Analysis	25-Mar	Ch. 13	HW 4
Guest lecture – Cybersecurity	27-Mar		
Vulnerability Assessment	1-Apr	Ch. 15	
Vital Area Identification	3-Apr		
Risk Assessment	8-Apr	Ch. 15	
Consequence Analysis	10-Apr		Exam 2
Guest lecture – The Science of Physical Protection	15-Apr		
System Design at Major Public Events	17-Apr		
Guest lecture – Biosecurity	22-Apr		HW 5
Nuclear Terrorism	24-Apr		
Illicit Trafficking of Nuclear Materials	29-Apr		HW 6
No class – Reading day	1-May		
No class	6-May		Final Exam

Course Policies:

1. Online Course Information

Blackboard will be used for posting grades, announcements and other course materials. Students can access Blackboard at <http://blackboard.vcu.edu/>. Some announcements may be made via e-mail. Students must use a VCU e-mail address and should check their e-mail regularly. Students are responsible for all material presented in class, provided via e-mail, or posted on Blackboard.

2. Class Assignments

A specific deadline will be given for the submittal of the homework and laboratory reports. They must be handed at the beginning of the class period on the date due.

Discussion and cooperation in order to solve homework problems is allowed and encouraged but all students must ultimately write up and submit their own work; however, copying homework is not permitted and will result in honor charges. No discussion will be allowed on quizzes and exams. List all classmates which you collaborated with on your assignments.

The student should follow these guidelines when submitting assignments:

- Student name, course and section number, page number and date at top of every page.
- Use only one side of the paper.
- Arrange problems in proper order.
- If submitted in paper all sheets must be numbered and held together with a paper binder clip.
- The solution of all problems should be presented clearly and neatly. Illegible or unintelligible homework submittals will not be graded.
- Assumptions must be clearly stated, and all work must be shown.
- Analysis and equations must follow a logical progression to completion.
- The units in all problems must be shown.

3. Attendance

Although class attendance and participation is not a specific part of the final grade, students are encouraged to attend the lectures regularly and actively participate in the classes.

4. Campus emergency information

What to know and do to be prepared for emergencies at VCU:

- Sign up to receive at alert.vcu.edu/signup/. It is essential to keep your information up-to-date within VCU Alert and to keep your permanent address and emergency contact information current in eServices.
- VCU uses a variety of communication methods to alert the campus community about emergency situations and safety threats. Learn more about types of alerts at alert.vcu.edu/know/typesofalerts.php
- Know the emergency phone number for the VCU Police (828-1234), and report suspicious activities and objects.

5. Class registration required for attendance

Students may attend only those classes for which they have registered. Faculty may not add students to class rosters or Blackboard. If students are attending a class for which they have not registered, they must stop attending.

6. Honor System: upholding academic integrity

The VCU Honor System policy describes the responsibilities of students, faculty and administration in upholding academic integrity. According to this policy, "Members of the academic community are required to conduct themselves in accordance with the highest standards of academic honesty, ethics and integrity at all times." Students are expected to read the policy in full and learn about requirements here: <https://conduct.students.vcu.edu/vcu-honor-system/>

7. Important dates

Important dates for the semester are listed in the VCU Academic Calendar: <https://academiccalendars.vcu.edu/>

8. Managing stress

Students may experience situations or challenges that can interfere with learning and interpersonal functioning including stress, anxiety, depression, alcohol and/or other drug use, concern for a friend or family member, loss, sleep difficulties, feeling hopeless or relationship problems. There are numerous campus resources available to students including University Counseling Services (804-828-6200 MPC Campus, 804-828-3964 MCV Campus), University Student Health Services (MPC 804 828-8828, MCV Campus 804 828-9220) and the Wellness Resource Center (804-828-9355). 24 hour emergency mental health support is available by calling 828-1234 and asking to speak to the on-call therapist or utilizing the National Suicide Prevention Lifeline (1-800-784-2433).

9. Mandatory responsibility of faculty members to report incidents of sexual misconduct

All employees, including faculty, department chairs and deans, are required to report any incidents of sexual assault, sexual exploitation and partner or relationship violence to the university's Title IX Coordinator.

Confidential offices which can provide support at VCU are: University Counseling Services (804) 828-6200

For more information about Title IX, please visit please visit <https://equity.vcu.edu/>.

9. Military short-term training or deployment

If military students receive orders for short-term training or for deployment/mobilization, they should inform and present their orders to Military Student Services and to their professor(s). For further information on policies and procedures contact Military Student Services at 828-5993 or access the corresponding policies.

10. Student conduct in the classroom

According to the [Faculty Guide to Student Conduct in Instructional Settings](#), "The university is a community of learners. Students, as well as faculty, have a responsibility for creating and maintaining an environment that supports effective instruction. In order for faculty members (including graduate teaching assistants) to provide and students to receive effective instruction in classrooms, laboratories, studios, online courses, and other learning areas, the university expects students to conduct themselves in an orderly and cooperative manner." Among other things, cell phones should be turned off while in the classroom. The Student Code of Conduct also prohibits the possession of or carrying of any weapon. For more information see <http://register.dls.virginia.gov/details.aspx?id=3436>.

11. Student email standard

Email is considered an official method for communication at VCU. Students are expected to check their official VCU email on a frequent and consistent basis (the university recommends daily) in order to remain informed of university-related communications. Students are responsible for the consequences of not reading, in a timely fashion, university-related communications sent to their official VCU student email account. Mail sent to the VCU email address may include notification of university-related actions, including disciplinary action. Students must read this standard in its entirety at <https://ts.vcu.edu/media/technology-services/content-assets/university-resources/ts-groups/information-security/StudentEmailStandard.pdf>

12. Student financial responsibility

Students assume the responsibility of full payment of tuition and fees generated from their registration, all charges for housing and dining services and other applicable miscellaneous charges. Students are ultimately responsible for any unpaid balance on their account as a result of the University Financial Aid Office or their third party sponsor canceling or reducing their award(s).

13. Students representing the university—excused absences

Students who represent the university (athletes and others) do not choose their schedules. All student athletes should provide their schedules to their instructors at the beginning of the semester. The Intercollegiate Athletic Council strongly encourages faculty to treat missed classes or exams (because of a scheduling conflict) as excused absences and urges faculty to work with the students to make up the work or exam.

14. Students with disabilities

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, as amended, require that VCU provide "academic adjustments" or "reasonable accommodations" to any student who has a physical or mental impairment that substantially limits a major life activity. To receive accommodations, students must register with the Office of Student Accessibility and Educational Opportunity on the Monroe Park Campus (828-2253) or the Division for Academic Success on the MCV campus (828-9782). Please also visit the Student Accessibility and Educational Opportunity website via <https://saeo.vcu.edu/> and/or the Division for Academic Success website via <https://das.vcu.edu/> for additional information.

Once students have completed the registration process, they should schedule a meeting with their instructor (s) and provide their instructor (s) with an official accommodation letter. Students should follow this procedure for all courses in the academic semester.

15. Withdrawal from classes

Before withdrawing from classes, students should consult their instructor as well as other appropriate university offices. Withdrawing from classes may negatively impact a student's financial aid award and his or her semester charges. To discuss financial aid and the student bill, visit the Student Services Center at 1015 Floyd Avenue (Harris Hall) and/or contact your financial aid counselor regarding the impact on your financial aid.

16. Faculty communication about students

VCU instructional faculty, administrators and staff maintain confidentiality of student records and disclose information in accordance with the Family Educational Rights and Privacy Act (FERPA). This means that VCU officials may disclose student record information without the consent of the student in certain situations. To support university operations, for example, VCU officials share information about students with other educational officials as necessary to perform their job duties. FERPA permits this disclosure to school officials who have a legitimate educational interest in the student information. In addition, VCU officials have obligations to report information shared by a student depending on the content of that information, for example, in compliance with VCU's policy on the duty to report. Unless FERPA permits a certain disclosure, VCU generally requires consent from a student to disclose information from their education record to another individual. You may find additional information on the VCU FERPA website: <http://rar.vcu.edu/records/family-educational-rights-and-privacy-act/>.