# **Course Syllabus**

# URBAN 575/IPM 509: Communications and Cyber Infrastructure Systems

Welcome to URBAN 575/IPM 509. This course explores the relationships between critical infrastructure and technology to include technical systems, human systems, and sociotechnical systems. It is essential to understand resources are always limited and when we design, implement, and operate with disregard to real versus idealized resources, vulnerabilities and risks are created.

While a spectrum of technologies will be considered and discussed, a particular emphasis will be on Internet of Things (IoT) and Operational Technology (OT) systems. Further, Security Operations, to include systems, processes, & technologies will be a substantial topic

#### **Course Preview**

- 8 lessons
- Reading assignments
- Periodic quizzes and homework
- Weekly required
  discussion forums
- Final exam

Where there is infrastructure there is almost always IoT. New infrastructure

will have IoT systems to support the infrastructure and many existing infrastructure systems are retrofitted with IoT systems. There is potential for IoT technologies and the data that it produces to have strong positive impact on operational efficiencies, variety of product lines, and overall value to institutional, corporate, government and citizen consumers. However, these technology systems also create new dependencies and hence create new risk. Often, organizations and governments do not have the expertise to be aware of, much less manage, this new risk.

This course will integrate these concepts and develop a mechanism for analytical thought around these complex challenges. The course also cover threats, exploits, & vulnerabilities and discuss how Security Operations addresses these. At the end of this course, the student will be able to converse, ask good questions, and demand thoughtful responses from others regarding these rapidly evolving connected and interconnecting systems and processes.

#### **Learning Objectives**

- Identify high level technical architecture used in many critical infrastructure systems
- Identify differences between Internet of Things (IoT) / Operational Technology (OT) and traditional Information Technology (IT)
- Analyze components of that architecture for operational and cybersecurity risk to include evolving threats, vulnerabilities, and exploits
- Understand the need for Security Operations and have a high level overview of Security Operations approaches & technologies.

 Develop the ability to frame high level conversations about critical infrastructure systems in a useful way and ask good questions. Learn to separate hype and mythology from reality in critical infrastructure system risk

# **Communications with your Instructor and Student Peers**

Online Discussion Forums allow you to communicate with other currently enrolled students and with your instructor. We encourage you to use the discussion forum to exchange ideas, resources, and comments about your coursework with other students in this course. Discussion forums are monitored by your instructor.

You can use e-mail to ask the instructor a question or, preferably, post your question on the General Discussion Forum. The instructor will reply to all discussion forum questions on the forum, and to e-mail questions via e-mail.

#### **Required Texts**

Benson, Chuck. *Managing IoT Systems for Institutions & Cities.* Boca Raton, Florida: Taylor & Francis/CRC Press, 2019. ISBN: 978-1-138-59048-9. This text is available as an eBook. See below for instructions to access the eBook via the UW Libraries.

Hayden, Ernie. *Critical Infrastructure Risk Assessment: The Definitive Threat Identification and Threat Reduction Handbook.* Brookfield, Connecticut: Rothstein Publishing, 2020. ISBN: 978-1-94448071-4.

# \*Instructions for searching the UW Libraries Catalog for eBooks for MIPM classes:\*

- 1. Use the University of Washington Libraries Catalog to see which eBook titles that the UW has purchased. <u>http://lib.washington.edu</u>
- 2. Use the search line at the top using the eBook's title and/or author's name to find it in the UWLibraries Catalog.
- 3. An eBook record will have a green "Online Access" link below the catalog record. If you see the green link, click it and you will be connected to the book, once you have provided identification.
- 4. You can find eBooks specifically by using the "Resource Type" box on the left side of the search results and selecting the "Show More" link. This will take you to another page that lists more media types, including "Ebooks." Click on "Ebooks."
- 5. The catalog record will tell you who publishes the eBook. We get many of our titles from ProQuestEbook Central, for example.
- 6. You will be prompted to type in your UW Husky ID (aka UW Net ID) and your password.

- 7. The Proquest Ebook Central site is pretty self-explanatory, and each book may have different conditions of use. In general, books are available on your computer for up to 21 days. You can also select to view individual chapters if you want. Note: some books may have a maximum number of users at one time. For your classes, we have selected eBooks that have unlimited user access.
- 8. At the end of 21 days, the book will no longer appear on your computer. However, you can simply download the book again.
- If you have difficulty connecting to your book, please directly email the College of Built Environments librarian, Alan Michelson, at <u>alanmich@uw.edu</u>. He will make every effort to help you with your problem.

#### Lessons

- Lesson 1: Introduction to Internet of Things (IoT) and Operational Technology (OT) Part I
- Lesson 2: Introduction to Internet of Things (IoT) and Operational Technology (OT) Part II
- Lesson 3: Introduction to Threats, Exploits & Vulnerabilities, Advanced Persistent Threats (APTs), & CISA
- Lesson 4: Security Operations Overview to include Security Operations Centers and components
- Lesson 5: Security Operations Detection & Response, Vulnerability Management, & Gartner technology "Hype Curve"
- Lesson 6: Cyber Incident Response
- Lesson 7: Artificial Intelligence (AI) in the IoT/OT & the Built Environment
- Lesson 8: Election Infrastructure

#### About the Forums, Assignments & Quizzes, & Final Project

Grading is weighted as indicated below.

Participation in Discussion Forums	30%
Assignments	30%
Quizzes	20%
Final Exam	20%

There will be weekly assignments and occasional quizzes presented through Canvas.

Regarding Discussion Forums, you are required to post to weekly discussions forums in this course. The topics are noted on the assignments for these lessons. In each case, you must post your comments in the forum (up to 70% of a forum discussion grade) and respond to at least two other posts from other students (each of the two responses is up to 15% of your forum discussion grade). You will be required to make a substantive post responding to the topic question, and to read the postings of all your classmates in preparation for either of the following:

- summarizing points where you agree and disagree; or submitting a revised posting, taking into
- account what you learned from the work of your classmates.

You will submit all discussion forum work through the relevant discussion forums on Canvas.

**Note:** If you have questions that you don't want to discuss with the entire class, you may e-mail your instructor directly. Your instructor reserves the right to post your direct questions—anonymously—on the discussion board if the questions seem important or representative enough that the entire class would benefit from them.

The discussion forums deadline is on Sundays at 11:59pm beginning the 2nd week of class. This deadline refers to both your initial post and the required comments. But in order for your colleagues to meaningfully comment on your post you need to give them some time. Therefore it is recommended that you to post your main entry to a week's discussion forum by the end of Friday thus giving your colleagues a couple of days, till the end of Sunday, for their comments.

The Final Exam will consist of questions similar to those in the Homework Assignments and Quizzes.

# **Grading and Assessment**

You will receive a numeric grade for this course. The numeric grading system used by the University of Washington relies on a decimal scale between 1.7 (low) and 4.0 (high).

For graduate courses, grades below 1.7 are recorded as 0.0 and no credit is earned. A minimum of 2.7 is required in each course that is counted toward a graduate degree. A 3.0 cumulative average in graduate work is required to receive a graduate degree.

# **Grading Criteria**

Grades on the assignments will be based on

- addressing all parts of each assignment;
- providing adequate treatment of each part of the assignment (for example, if an item calls for an explanation of factors involved, an answer that lists factors without explaining them will be inadequate);

- relating your work on the assignments to course readings, lessons, discussions, or supplementary readings as appropriate; and
- documenting your sources (that is, providing citations to published material, government documents, personal interviews).

Assignments that are partially completed will not be graded.

Here are descriptions of the criteria for your performance in this class. If you meet these criteria for all your work, you will be graded appropriately. Instructors may "interpolate" grades between these standards as they see fit.

Excellent and exceptional work for a graduate student. Work at this level is consistently creative (where appropriate), thorough, well-reasoned, insightful, well written and shows clear recognition

4.0 and incisive understanding of the important materials and issues. All assignments submitted are of good professional quality. The value of individual contributions to this course is considerable and positively affects the learning of all participants.

Strong work for a graduate student. Work at this level sometimes shows signs of creativity, is thorough and well reasoned, and demonstrates clear recognition and good understanding of the

3.7 important materials and issues. Assignments submitted lack professional quality but demonstrate effort and concern for quality. The value of individual contributions to the course is strong and occasionally significant.

Competent and sound work for a graduate student. Work is well reasoned and thorough but not especially creative or insightful. The student shows adequate understanding of the important materials and issues although that understanding may be somewhat incomplete. Work submitted is competent

- 3.3 but not remarkable. The value of individual contributions to the course is such that they do not influence the quality of the course one way or the other. This grade indicates neither exceptional strengths nor exceptional weaknesses, but is the grade for "average" graduate performance.
- 3.0 Adequate work for a graduate student. Work is moderately thorough and well reasoned, but with

some indications that some of the important materials and issues is less than complete and perhaps inadequate for graduate study. The value of individual contributions to the course is minimal. However, the work is above the minimal expectations for the course.

Borderline work for a graduate student. Work barely meets the minimal expectations for the course and may occasionally fall below them. Understanding of the important materials and issues is incomplete or has not been demonstrated. There is little positive

2.7 value in the individual contributions to the course and there may even be negative effects on the overall learning. Consistent overall performance at this level would be below that of adequate graduate student performance.

# Study Tips

Exercises from this class are open-book, so no memorization is involved in the course. The course is designed for you to learn from readings and from completing the assignments.

- Pace yourself.
- Set aside time each week that is dedicated exclusively to the course.
- Do the readings and explore the topic using the link(s) in the lesson.
- Begin assignments as soon as possible after completing the readings. Use all available resources, including your fellow classmates.
- For the assignments, select a topic for your final project that you have a real interest in. Incidents close to home may be easier in term of obtaining information.