

CSE 316/426 - Cyber Physical Systems Security Syllabus

Online Only. Covid-19 University Directive.

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Office Hours: email me or drop a message in the discord server: <https://discord.gg/jPakdGe>

Course Description

Cyber Physical Systems Security (CPSS) breaches and defense, standardization, best practices, policies, protection-in-depth modeling, vulnerability and risk assessment for CPSS, CPSS and cyberwarfare, industrial control systems, Internet-of-Things (IoT).

Textbook

No text book is required. All the articles are posted in D2L for the respective week.

Agenda

| W | Topic | Homework/Assignment |
|----|---|---|
| 1 | CPSS: Concepts and Principles | <i>Monitoring Security of Networked Control Systems - It's the Physics</i> |
| 2 | Security Breaches and Defenses in CPS | <i>Robust Cyber-Physical Systems: Concept, models, and implementation</i> |
| 3 | ICS/SCADA Security [Part 1] | <i>Lab 1 and Lab 2</i> |
| 4 | ICS/SCADA Security [Part 2] | <i>Lab 3 and Lab 4</i> |
| 5 | ICS/SCADA Security [Part 3] | <i>Lab 5 and Lab 6</i> |
| 6 | IoT Security | Research on IoT Hacks |
| 7 | CPSS: Legal and Privacy Aspects | <i>Designing Ethical Cyber-Physical Industrial Systems</i> |
| 8 | CPSS and Risk Assessment | <i>Safety and Security in Cyber-Physical Systems and Internet-of-Things Systems</i> |
| 9 | CPSS and Cyberwarfare | <i>Draft Paper / Presentation</i> |
| 10 | Paper/Presentation [PowerPoint 5 slides; voice over, submitted into the D2L folder] | |

Assignments and Grading

Homeworks/Assignments are due a week 11:59 PM after each one is assigned. No late assignments will be accepted. Absolutely NO grade bargaining will be allowed.

| Assignment | Weight in final grade |
|-----------------|-----------------------|
| Homework | 20% |
| Labs | 30% |
| Project / Paper | 50% |
| Presentation | 10% |

Grading is based on a percentage basis, which is then convert to a letter as:

| Percentage Grade | Letter Grade | Manner of fulfillment |
|------------------|--------------|-----------------------|
| 92-100 | A | Excellent |
| 90-91 | A- | |
| 88-89 | B+ | |
| 82-87 | B | Very Good |
| 80-81 | B- | |
| 78-79 | C+ | |
| 72-77 | C | Satisfactory |
| 70-71 | C- | |
| 68-69 | D+ | |
| 62-67 | D | Poor |
| 60-61 | D- | |
| 0-59 | F | |

Homework

On weeks where there are articles assigned, you need to critically review them. What's an article? A journal/conference paper. What's critical review? It's not summarizing the article as in "Authors said...". DO NOT tell me what the authors have said. I have assigned this reading to you so I already know what they have said. Instead, you need to analyze the content of the article in the context of the lectures and provide your constructive opinion on the implications steaming from the problem/solution at stake.

Labs

All labs will be conducted using a virtual machine. You can download it:

<https://drive.google.com/file/d/1Xlg9yNGRdopRPIz6lzJqapJ5byraZ0vH/view?ts=5cb8d244>

The Lab manuals are included in the respective submission folders.

Project

Any security assessment of a cyber-physical system will do. Constructive, practical, applied, and critical approaches are encouraged and expected. If you want to analyze something practical, do it. No shallow work with simple citations from Wired or Gizmodo will be accepted. This is an advanced class and your project/paper needs to demonstrate you have successfully achieved the learning objectives in this class. Reading online articles and copy/paste simple text is not one of them. You have access to unlimited throve of academic articles, books, and proceedings through DePaul's Library. Use it.

Presentation

You will do a PowerPoint presentation. Record your voice. Submit it into the respective folder. No more than 5 slides. The gist of your paper. Extra content or extra slides will be penalized. Its more simple than you think it is. I need to hear your contribution in the project. Briefly and precisely to the point.

Class Pragmatics

If you somehow contemplate the thought: “Jeez, this is hard...I will email the professor, at least I won’t make a mistake...” DO NOT email me. It’s hard on purpose. Make mistakes. Learn from them. Communicate the problem on the class discussion forum, some of the colleagues might have already figure it out. Share your knowledge and experience with the problem. If in doubt or have a dilemma about multiple ways of approaching the problem, ALWAYS choose the hardest one. Again, DO NOT email me.

Email me only if you notice an obvious problem, hurdle, or if something doesn’t work for the ENTIRE class. The course is designed for you to pick up skills, knowledge, and abilities in addition to learning cyber-physical systems. Don’t forget, this is a security class. Security is a personal endeavor and success is only achieved with perseverance and mostly self-motivated independent learning. My job is to reinforce this type of learning. You will thank me later after you graduate and get a fancy security gig.

Learning Outcomes

At the end of the course the students will be able to:

1. Analyze CPSS breaches and develop defensive measures;
2. Employ CPSS best practices to create and implement policies for CPSS protections
3. Model CPSS protection-in-depth for industrial control system and IoT systems.
4. Perform CPSS risk assessment
5. Evaluate CPSS breaches and defenses in the context of cyberwarfare

Other Important Information

1. Attendance: I expect you will attend every class [or watch the lecture].
2. Class Cancelation: Unless DePaul closes because of weather, we will have class.
3. Academic Integrity: I expect that you have read and understood DePaul’s Academic Integrity policy: <https://offices.depaul.edu/academic-affairs/faculty-resources/academic-integrity/Pages/default.aspx>
4. Changes to Syllabus: I reserve the right to change the syllabus and you will be timely informed of such changes.

5. Academic Policies: <https://www.cdm.depaul.edu/Student-Resources/Pages/PoliciesandProcedures.aspx>
6. Students with disabilities: Contact the instructor or the Center for Students with Disabilities (CSD) at: csd@depaul.edu prior to the class start.
7. Online Teaching Evaluation: Please evaluate the course in CampusConnect when you receive a notification towards the end of the quarter.
8. Preferred Name & Gender Pronouns: I will gladly honor your request to address you by an alternate name or gender pronoun:
<https://policies.depaul.edu/login.aspx?ReturnUrl=/policy/policy.aspx?pid=332>