EEL 4930/5930 Cyber-Physical Systems Security

Spring 2020

Instructor:	C. Harrys Konstantinou	**Time:**	TR 11am-12.15pm
Email:	konstantinou@eng.famu.fsu.edu	**Place:**	A125
Course webpage:	eng.famu.fsu.edu/ konstantinou/cps20	**Office:**	B-371

Course Description: The course covers introductory topics in security at both the physical layer and the cyber layer of Cyber-Physical Systems (CPS) (especially smart grid systems). The main objective of the course is to expose students to fundamental information security primitives and to understand the challenges in designing and securing CPS. Students will investigate different techniques used to model and analyze industrial CPS processes.

Objectives: To understand the issues in designing and analyzing CPS, what makes CPS hard to secure, common methods used to secure CPS, and the differences between securing traditional enterprise systems and industrial CPS. To investigate system design, monitoring, scheduling, management and control issues in the full lifecycle of CPS design and implementation. To develop the ability to interact with CPS components, learn CPS protocols, perform vulnerability assessment on CPS protocols and systems, design CPS and architectures that are resilient to attacks.

Prerequisites: The course is largely self-contained and will introduce the necessary technologies required for a qualitative (rather than quantitative) understanding of the security landscape of industrial CPS. Undergraduate/graduate courses in power systems, computer architecture, networking, and programming are preferred but not required (e.g., EEL 3112, EEL 3705, EEL 3216, COP 3330, COP 3353, EEL 4713, EEL 4746). It is assumed that the students are familiar and have good background using a least one programming language, such as C, C++, Python, MATLAB.

Instructor's Office Hours:

- Before class (9.30am - 11am), or
- Other times by appointment only.

Lab Meeting Dates (Time: 11am-12:15pm, Location: CAPS* Room #131):

- Lab 1: Thur, Jan 16
- Lab 2: Thur, Jan 30
- Lab 3: Thur, Feb 13
- Lab 4: Thur, Feb 27
- Lab 5: Thur, Mar 12
- Lab 6: Thur, Mar 26

Lab Assistant Office Dates (Time: 9:30am-11am, Location: CAPS* Room #131):

- Lab 1: Thur, Jan 23
- Lab 2: Thur, Jan 6
- Lab 3: Thur, Feb 20
- Lab 4: Thur, Mar 5
- Lab 5: Tue, Mar 24
- Lab 6: Thur, Apr 2

*CAPS: 2000 Levy Ave, Building A, Tallahassee, FL 32310, USA

Main References:

- Instructor's lecture notes and handouts.
- A number of relevant papers from recent journal publications and conference proceedings will be discussed.
- There is no mandated textbook. Recommended books are:
  - "Industrial Network Security: Securing Critical Infrastructure Networks for Smart Grid, SCADA, and Other Industrial Control Systems" by E. D. Knapp and J. T. Langill.
  - "Cyber-Physical Attacks: A Growing Invisible Threat" by G. Loukas.

Grading Policy:

- Online Active Participation (15%).
- Midterm (15%).
- Final Exam (10%).
- Assignments (6 labs) (60%).

Grading Scale:

- A if $\geq 90\%$ & $\leq 100\%$
- B if $\geq 80\%$ & $\leq 89\%$
- C if $\geq 70\%$ & $\leq 79\%$
- D if $\geq 60\%$ & $\leq 69\%$
- F otherwise

Course Outline: https://ww2.eng.famu.fsu.edu/ konstantinou/cps20/readings.html
Course Policy:

- A topic will be assigned each week on Canvas and students are required to participate in the discussion boards. Participation is: 1) answering questions posed in the topic description, 2) answering questions posed by other students or the instructor, 3) posting interesting/insightful summaries on articles that pertain to the weeks coursework but not necessarily have to be on the topic. Participation is not: 1) simple two sentence responses, 2) linking to articles, 3), copying and pasting.
- Lab assignments: As part of this course, we will have 6 bi-weekly hands-on lab exercises. The dates for these lab exercises can be found in the course website & outline. Each student is expected to read the lab description prior each in-lab session. During the lab, the lab assistant will demonstrate and explain each step of the exercise. The lab report with the deliverables is due two weeks after the lab is done/completed (prior the next one). If the submission is after the indicated deadline and within the next 24hrs, the report will be graded for a maximum of 50% of the total points. No lab reports will be accepted once they are more than 24hrs late. Please refer to the lab report guidelines for instructions.
- Class attendance: Both FAMU and FSU have a class attendance policy to comply with federal Title IV financial aid requirements. All students are required to attend classes regularly and be on time. Tardiness is no excuse and will be considered as being absent.
- Mandatory first day of classes attendance policy: Students who do not attend classes on the first day of classes may be dropped from their courses.
- You will not receive extensions, unless you contact me ahead of time and make the proper arrangements. Late assignments/projects/etc. will not be accepted.
- Last day to drop a course: Check with your University. No course drops will be allowed after this date except for: medical emergency, military service, administrative correction, and other (consult instructor).

Academic Honesty:
The full text of the Academic Honesty Policy is in the *Student Handbook*.

Resources:

- Undergraduate students: https://www.eng.famu.fsu.edu/undergraduate/student-handbook
- Graduate students: https://www.eng.famu.fsu.edu/ece/graduate/resources

Registring for this course means your agreement to this class policy and syllabus.

IMPORTANT UNIVERSITY & COLLEGE POLICIES provided as an APPENDIX

FAMU-FSU
College of Engineering

IMPORTANT UNIVERSITY & COLLEGE POLICIES (Addendum to Syllabus)

The FAMU-FSU College of Engineering website provides several resources, links, and deadlines that students should know about. These include:

Important Deadlines, including late drop/withdrawal, retroactive drop/withdrawal, and graduation application: https://www.eng.famu.fsu.edu/students/academic-deadlines

Student Resources: https://www.eng.famu.fsu.edu/student-resources

Undergraduate Student Handbook:
https://www.eng.famu.fsu.edu/undergraduate/student-handbook

Graduate Student Resources links: https://www.eng.famu.fsu.edu/student-resources

Program Outcomes/Student Learning Outcomes for engineering programs:
https://eng.famu.fsu.edu/about/accreditation

Academic Learning Compacts (ALC) for degree programs:
COE: https://eng.famu.fsu.edu/about/accreditation/outcomes-alc-sacs
FAMU: http://www.famu.edu/index.cfm?Assessment&CurrentALCs#engineering
FSU: https://learningforlife.capd.fsu.edu/smalcs/learningCompacts.cfm

Sexual Misconduct: https://www.eng.famu.fsu.edu/sexual-misconduct

University Attendance Policy (Required for face-to-face/traditional courses)

Excused absences include documented illness, deaths in the family and other documented crises, call to active military duty or jury duty, religious holy days, and official University activities. These absences will be accommodated in a way that does not arbitrarily penalize students who have a valid excuse. Consideration will also be given to students whose dependent children experience serious illness.

The College of Engineering has a restrictive interpretation of what is considered a valid excuse for an absence. See https://www.eng.famu.fsu.edu/undergraduate/student-handbook. Students may request an "Official Student Excuse" from Student Services and Undergraduate Affairs, B111. An excused absence does not necessarily excuse you from any missed course work. You must contact your course instructor to determine if you are eligible for any makeup assignments. Students should request an excused absence before it will occur if possible, or immediately upon their return to campus, and must bring verifiable documentation to justify the excuse. Excessive delay in requesting an excused absence or providing appropriate documentation may result in the request being denied. Deliberately providing false, forged, or misleading documentation may result in academic sanctions against the student.

Academic Honesty or Honor Policy

Academic Honesty or Honor Policy violations shall be reported and appropriate actions taken by the Department Chair and Associate Dean, as appropriate for undergraduate or graduate students. Students are expected to uphold the University Student Code of Conduct and/or University Academic Honor Code for their home university, FAMU or FSU.

> The **Florida A&M University** is committed to academic honesty and its core values which include scholarship, excellence, accountability, integrity, fairness, respect, and ethics. These core values are integrated into its academic honesty policy. Being unaware of the Academic Honesty Policy is not a defense to violations of academic honesty.
> (Ref: https://www.famu.edu/BOT/Academic%20Honesty%20Policy%207.27.17.pdf)

The **Florida State University** Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to "...be honest and truthful and...[to] strive for personal and institutional integrity at Florida State University."
(Ref: http://fda.fsu.edu/Academics/Academic-Honor-Policy) **UPDATED 3/4/2016**

Americans with Disabilities Act

This syllabus and other class materials are available in alternative format upon request.

Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from the FAMU Center for Disability Access and Resources (CEDAR) or FSU Student Disability Resource Center (SDRC) has been provided.

FAMU students with disabilities needing academic accommodation should:

1) register with and provide documentation to FAMU CEDAR; and
2) bring a letter from CEDAR to the instructor indicating the need for accommodation and what type.

For more information about services available to FAMU students with disabilities, contact:

Center for Disability Access and Resources (CEDAR)
Florida A&M University
640 Gamble Street, Tallahassee, FL 32307
(850) 599-3180 (voice); (850) 561-2513 (fax)
cedar@famu.edu
http://www.famu.edu/index.cfm?cedar

FSU students with disabilities needing academic accommodation should:

1) register with and provide documentation to FSU SDRC; and
2) bring a letter from SDRC to the instructor indicating the need for accommodation and what type.

For more information about services available to FSU students with disabilities, contact:

Student Disability Resource Center (SDRC)

Florida State University
Tallahassee Campus
874 Traditions Way
108 Student Services Building
Tallahassee, FL 32306-4167
(850) 644-9566 (voice)
(850) 644-8504 (TDD)
sdrc@admin.fsu.edu
http://www.disabilitycenter.fsu.edu

Florida State University
Panama City Campus
Office of Student Affairs
2nd floor Barron Building, Room 215
Panama City, FL. 32405
(850) 770-2172 (voice)
(866) 693-7872 (toll-free)
sds@pc.fsu.edu
http://pc.fsu.edu/students/student-disability-services

University's Non-Discrimination Policy Statement

FAMU: http://www.famu.edu/index.cfm?EOP&NON-DISCRIMINATIONPOLICYSTATEMENT
FSU: http://www.hr.fsu.edu/PDF/Publications/diversity/EEO_Statement.pdf

Syllabus Change Policy

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice.