Syllabus

Course Information
- **Course Number and Title**: EEL4765 – Hardware Security
- **Credit Hours:** 3 credits: 3 Lecture, 0 Lab
- **Academic Term:** Spring 2026

Instructor Information
- **Instructor:** Mohammad Farmani
- **Office Location:** BARC-1102
- **Office Hours**:
  - M: 10:00 am - 1:00 pm
  - TR: 10:00 am -11:00 am
  - Or by appointment through Teams
- **Email address**: mfarmani@floridapoly.edu

Course Delivery and Course Description

- **Delivery Mode**: Face-to-face (in-person / in-class) IST 1049, TR: 2:00 pm – 3:15 pm
- **Course Website**: Canvas
- **Official Catalog Course Description**: This course covers the basic algebra of finite fields, the mathematical theory of selective cryptographic primitives, the different security threats across both circuit and microarchitecture levels in the modern electronic hardware designs, the test and verification of cryptographic hardware, and hardware Trojans. The attack models and the state-of-the-art defense techniques will be demonstrated through multiple resources such as selected chapters from textbooks, papers, videos, and simulation frameworks. Students will gain in-depth knowledge by applying the theoretical concepts on the practical case studies through completing multiple projects. The enrolled students need to have preliminary knowledge in diverse fields such as digital logic design, microarchitecture and memory subsystem, circuit testing, cryptography, and FPGA.
  - **Course Pre and/or Co-Requisites**: EEE 3310 - Digital Electronics, and EEL 4768C - Computer Architecture and Organization,
  - **Communication/Computation Skills Requirement (6A-10.030)**: N
- **Required Texts and Materials**
  - **Required Textbook:**
    - *Hardware Security: A Hands-on Learning Approach*, 1st Edition, by Swarup Bhunia and Mark Tehranipoor, Morgan Kaufmann, ISBN 978-0128124772.
  - **Supplementary References (recommended):**
    - *Hardware Security: Design, Threats, and Safeguards*, Debdeep Mukhopadhyay, Rajat Subhra Chakraborty, CRC Press, ISBN 978-1439895832.

Students will also read selected research papers and technical documentation posted on Canvas.

Course Objectives and Outcomes

Course Objectives: .
- Develop a comprehensive understanding of the mathematical foundations of cryptographic primitives and their hardware implementation.
- Explore security vulnerabilities in modern electronic hardware at both circuit and microarchitecture levels.
- Examine test and verification strategies for secure cryptographic hardware.
- Understand attack models, including physical attacks, hardware Trojans, and side-channel analysis, alongside state-of-the-art defense mechanisms.
- Enhance practical skills through simulation frameworks, case studies, and project-based learning involving FPGA and VLSI tools.

Course Learning Outcomes (CLOs):
After successfully completing the course with a grade of C (2.0/4.0) or better, the student should be able to do the following Learning Outcomes of Instruction:

#	CLOs	Bloom's Learning Level	Alignment ABET Outcomes
1.	Understand the mathematical basis of finite fields and cryptographic primitives.	Understanding (2)	1
2.	Identify and analyze security vulnerabilities in electronic hardware.	Analyze (4)	2
3.	Design and test cryptographic hardware for robustness against attacks.	Create (6)	6
4.	Simulate and evaluate security frameworks using FPGA and VLSI tools.	Evaluate (5)	7
5.	Apply theoretical knowledge to practical case studies and projects.	Apply (3)	5
6.	Demonstrate effective communication of technical concepts and findings.	Communicate (3)	1

Academic Support Resources

- **Library**: Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to library@floridapoly.edu.
- **Peer Learning Strategists (PLS)**: Are specially trained student leaders who help their peers strategize approaches to course content and work through solution methods. PLS work in collaboration with the courses they support so the content and methods are aligned with your

instructors' expectations. Students can meet with a PLS in The Learning Center, which is located on the first floor of the Innovation, Science and Technology (IST) building in room 1019.

- **Academic Success Coaches**: All students at Florida Poly are assigned an Academic Success Coach. Your Academic Success Coach can assist you with academic success strategies. Please visit the Student Success Center on the second floor of the IST building to meet with an Academic Success Coach.
- **Writing Center**: Located on the second floor of the IST (2059/2061), the Writing Center helps students to develop their writing and presentation skills. Consultations are available in person and virtually. For more detail, visit https://floridapoly.edu/writingcenter.

Civility and Collegiality (optional statement)

Faculty and students come to the university for the same reason, which is to participate in a highly professional educational environment. To that end, both students and faculty are expected to treat each other with mutual regard and civility. Communication, written, oral and behavioral, between faculty and students must remain respectful. Within and outside of the classroom, students must refrain from derogatory comments toward the faculty member and their fellow students, and faculty as well must refrain from derogatory comments toward their students. Faculty and students should address each other with respect, in accordance with the wishes of the faculty and the students: for example, no one should be addressed by their last name alone.

Faculty from the outset of a course can and should specify what constitutes activities and behavior that take away from, that diminish, the educational environment. An individual student's distracting behavior impedes the education of fellow students, which itself is a form of disrespect. Civility and collegiality also include respecting each other's time: for example, neither students nor faculty should arrive late to class (unless unforeseen, pressing circumstances prevail); faculty should be present at the posted office hours; and students and faculty should be punctual when meeting times are scheduled. In more general terms, collegiality means respecting the right of both faculty and students to participate fully and fairly in the educational enterprise.

Course Policies

Attendance

- Students in courses are expected "to attend all of their scheduled University classes and to satisfy all academic objectives as defined by the instructor" (University Policy, FPU-5.0010AP).
- Exceptions to any attendance requirements may be made on a case-by-case basis.

Participation

Students are expected to participate in the classroom experience. The use of earbuds/headphones during class is specifically not allowed and students who engage in this behavior may be asked to leave the class for the day (noting exceptions for authorized accommodations). In addition, students who routinely do not bring materials to class that are required for participation, will not be given credit for class attendance, and if this becomes a pattern of behavior, may be asked to leave the class for the day. Persistent problems with participation may result in a code of conduct referral.

Late Work/Make-up work

- No makeup tests or quizzes, except in case of emergency, e.g. illness and accident. For makeup tests, a medical certificate is required and the instructor must be notified in advance of the test.
- Exceptions to any attendance requirements may be made on a case-by-case basis.

Grading Scale

The grading scale that will be used in the course is:. (See also [University Grading Policy](#)).

Grade	Percentage
A	100 – 90
A-	89 – 87
B+	86 – 84
B	83 – 80
B-	89 – 77
C+	76 – 74
C	73 – 70
C-	69 – 67
D+	66 – 64
D	63 – 62
D-	61-60
F	59 – 0

Assignment/Evaluation Methods

Grade items: Quizzes, assignments, and Final Exam throughout the semester after the completion of a specific topic area – see the schedule for more details.	Points
Attendance/Participation	5
Homework Assignments	15
Pop Quizzes	10
Midterm Exams	15
Student Paper Presentations	15
Final Project	20
Final Exam	20
Total	100

Departmental Requirements: At least 30% of the course grade must come from individual in-class assessments and evaluations.

University Policies

Reasonable Accommodations

The University is committed to ensuring equal access to all educational opportunities. The University, through the Office of Disability Services (ODS), facilitates reasonable accommodations for students with disabilities and documented eligibility. It is the student's responsibility to self-identify as a student with disabilities and register with ODS to request accommodations.

If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course through the ODS student portal and communicate with your instructor about your approved accommodations as soon as possible. Arrangements for testing accommodations must be made in advance. Accommodation is not retroactive.
If you are not registered with ODS but believe you have a temporary health condition or permanent disability requiring accommodation, please contact ODS as soon as possible.

> The Office of Disability Services (ODS):
> DisabilityServices@floridapoly.edu
> (863) 874-8770
> The Access Point
> ODS website: www.floridapoly.edy/disability

Accommodations for Religious Observances, Practices and Beliefs

The University will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments. (See University Policy.)

Title IX

Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. Resources are available if you or someone you know needs assistance. You may speak to your professor, but your professors have an obligation to report the incident to the Title IX Coordinator. Please know, however, that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University Ombuds Office, BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at Peace River Center, 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment. The Title IX Coordinator is available for any questions to discussion resources and options available.

Academic Integrity

The faculty and administration take academic integrity very seriously. Violations of academic integrity regulation include actions such as cheating, plagiarism, use of unauthorized resources (including but not limited to use of Artificial Intelligence tools), illegal use of intellectual property, and inappropriately aiding other students. Such actions undermine the central mission of the university and negatively impact the value of your Florida Poly degree. Suspected violations will be fully investigated, possibly resulting in an academic integrity hearing and sanctions against the accused student if found in violation. Sanctions range from receiving a zero on the exam or assignment, to expulsion from the university. Repeat offenders are subject to more severe sanctions and penalties.

Any "special" instructions that are appropriate for academic integrity and the course should go here.
(It is essential that a heading and a statement on what constitutes, includes, academic integrity be included in the syllabus, and that the students be made aware of academic integrity at the beginning of a course.)

Recording Lectures

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. Recordings may not be used as a substitute for class participation or class attendance. Recordings may not be published or shared in any way, either intentionally or accidentally, without the written consent of the faculty member. Failure to adhere to these requirements is a violation of state law (subject to civil penalty) and the student code of conduct (subject to disciplinary action).

*Recording class activities other than class lectures, including but not limited to lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), and invited guest speakers is **prohibited**.*

Disclaimer: Changes in syllabus and assignment sheets may be modified as deemed appropriate. All changes will be announced in class and in Canvas Announcements.

Naming Files: Name the file as the Assignment or Exam, e.g. Assignment # 1, Midterm #1, etc. DO NOT Put any other extensions of your name, assignment description, course name, etc. The canvas recognizes your name, the course name and course number.

TENTATIVE COURSE SCHEDULE

Week	Dates	Topics (Tentative)	Class Meetings	Major Assessment(s) (Tentative)
1	Jan 12 – 18	Syllabus, course policies, ethics, Introduction to hardware security, threat landscape.	2 (first class Jan 13)	Participation starts; HW0 (syllabus acknowledgment).
2	Jan 19 – 25	Intro to cryptography and basic primitives; cryptographic hardware concepts.	2	Homework 1 assigned.
3	Jan 26 – Feb 1	Basics of VLSI design, testing, and verification for secure hardware implementations.	2	Quiz 1 (intro and crypto basics).
4	Feb 2 – 8	Physically Unclonable Functions (PUFs) and True Random Number Generators (TRNGs).	2	Homework 1 due; Homework 2 assigned.
5	Feb 9 – 15	Hardware metering and watermarking of IP blocks; IP protection.	2	Quiz 2; project topics released.
6	Feb 16 – 22	Physical attacks, fault injection attacks, and CAD tools for hardware security.	2	Homework 2 due.
7	Feb 23 – Mar 1	Side-channel attacks (power, timing, EM) and countermeasures.	2	Quiz 3; Midterm review.
8	Mar 2 – 8	**Midterm Exam**; wrap-up of side-channel topics and mitigation strategies.	2	Midterm exam (in class).
9	Mar 9 – 15	Spring Break, No Classes	0	—
10	Mar 16 – 22	Counterfeit detection, FPGA security, vulnerability detection tools.	2	Homework 3 assigned; project milestones checkpoint.
11	Mar 23 – 29	Hardware Trojans: models, insertion, detection, and prevention.	2	Quiz 4; Homework 3 due.
12	Mar 30 – Apr 5	Student paper presentations: selected topics in hardware security (1st set).	2	Presentation Group A.
13	Apr 6 – 12	Student paper presentations: advanced topics and case studies (2nd set).	2	Presentation Group B.
14	Apr 13 – 19	Student paper presentations wrap-up; project design reviews.	2	Presentation Group C; Final project guidance.
15	Apr 20 – 26	Final project development, lab-style working sessions, and project presentations.	2	Final project presentations; final report due.
16	Apr 27 – 28	Course review, integration of concepts, and exam preparation (last class Apr 28).	1–2	Final exam review session.
17	Apr 29 – May 1	Reading days (no regular class meetings – per University calendar).	0	—

Week	Dates	Topics (Tentative)	Class Meetings	Major Assessment(s) (Tentative)
18	May 2 – 8 (TBA)	**Final Exam** – comprehensive, with emphasis on post-midterm material (date/time per registrar).	1 (exam)	Final exam.

Note: The famous quote "Tell me and I forget; teach me and I may remember; involve me, and I learn."
WITHDRAWAL DATE WITHOUT ACADEMIC PENALTY DEADLINE (W ASSIGNED): APRIL 17, 2026