



WICHITA STATE  
UNIVERSITY

## **ECE 396, Introduction to Hardware Security, Spring, 2026**

(Hardware to Strengthen Computing Security and Foster Trust)

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- Preferred Method of Contact: In person during office hours or e-mail
- Classroom, Day/Time: TBD
- Student/Office Hours: TBD
- Prerequisite(s): ECE 194
- Teaching Assistant (TA): Lab and Grading – TBD
- TA Contacts: Lab and Grading – [tbd@shockers.wichita.edu](mailto:tbd@shockers.wichita.edu)

### **How to use this syllabus**

This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves. Any changes should be shared via lecture and/or Blackboard.

### **University Policies and Procedures**

The Wichita State University Policies and Procedures Manual can be found at:  
<https://www.wichita.edu/about/policy/>.

### **Academic Integrity**

Students at Wichita State University are expected to uphold high academic standards. WSU will not tolerate a lack of academic integrity. Students are responsible for knowing and following the Student Code of Conduct [http://webs.wichita.edu/inaudit/ch8\\_05.htm](http://webs.wichita.edu/inaudit/ch8_05.htm) and the Student Academic Honesty policy [http://webs.wichita.edu/inaudit/ch2\\_17.htm](http://webs.wichita.edu/inaudit/ch2_17.htm). When the faculty member determines sanctions are warranted for violations of academic integrity, regardless of severity, the faculty member must report the infraction to the Office of Student Conduct and Community Standards. If you need more information about the process or wish to appeal a decision, please visit [https://www.wichita.edu/about/student\\_conduct/ai.php](https://www.wichita.edu/about/student_conduct/ai.php)

Homework (HW) assignments in this course will be individual assignments (unless otherwise stated). Students can discuss with others, but they should not write the solution together; one submission (wording/coding) should be reasonably different from other submissions. "Collaboration is good, cheating is not!" There will be severe consequences for academic dishonesty. Cheating (such as copying and pasting word-for-word from other sources) in any test will automatically result in a Fail' grade in this course; this grading policy applies to all parties involved (including the ones who help/show).

## **Course Description**

Introduces the role of hardware solutions to enhance computing security and build trust. Important topics include fundamentals of hardware security for integrated circuits and systems, cryptographic hardware, invasive and non-invasive attacks, side-channel attacks, true random number generation, physically unclonable functions, secure processor architecture, and secure distributed systems. Credit-Hour: 3.  
Prerequisite: ECE 194 with a C- or better grade.

## **Measurable Student Learning Outcomes**

*The following Engineering Accreditation Commission (EAC) Student Outcomes (SOs) are aligned to this course.*

After passing this course, students should be able to:

- (EAC: SO-1) analyze computer security issues and apply the hardware-based solutions (e.g., true random number generation and cryptographic hardware) to solve real-world engineering problems.
- (EAC: SO-2) design and implement hardware-based security solutions for building trust through strengthening computer security.

## **Required Texts/Readings Textbook**

Textbook: "Hardware Security: A Hand-on Training Approach" by S. Bhunia and M. Tehranipoor, Morgan Kaufman, 2018, Edition 1.

Reference: "Principles of Secure Processor Architecture Design" by J. Szefer, Morgan & Claypool, 2018, Edition 1.

## **Other Readings**

Class notes and reading materials (on hardware security) will be made available via WSU Blackboard. Project topics and related materials also will be made available via WSU Blackboard.

## **Other Equipment/Materials**

If needed, students will be provided with information about computing servers and service support so that they can work on programming assignments. More information will be provided during class lectures as may require.

## Class Protocol

There are points on class performance. It is expected that students will join the instructor and/or TA before class/lab sessions start. Students are always encouraged to ask questions, especially if they find ambiguity in assignments and materials covered.

## Contact Policy

Although you may attempt to reach me in-person or by phone, email communication is always preferred. Feel free to email me any questions and/or concerns following these guidelines:

- **Always** email me from your WSU email address and/or through Blackboard.
- Always use the course name in the subject line of the email.
- Remember to sign your name.
- If you have a problem with accessing or uploading assignments, you should let me know as soon as possible before the assignment is due. You will also have to accompany this notification with the file in question, so I can verify that it is completed by the due date/time.
- I offer a Discussion Forum on Blackboard which allows common questions to be seen and responded to publicly.
- You **should NOT** contact me for tech support.
  - Any technical problems involving your computer, or issues regarding file uploading or sharing, should go through the OneStop. You can contact them at 316-978-3909. You can also fill out a request for help form at their [website](https://wichita.edusupportcenter.com/sims/helpcenter/common/layout/SelectHelpHome.seam?inst_name=wichita):  
[https://wichita.edusupportcenter.com/sims/helpcenter/common/layout/SelectHelpHome.seam?inst\\_name=wichita](https://wichita.edusupportcenter.com/sims/helpcenter/common/layout/SelectHelpHome.seam?inst_name=wichita)

## Response Time

### To Email and Discussion Forum Questions:

I answer your questions as soon as possible within 24 hours. If you do not receive reply to your email within 24 hours, please re-send me the email, probably the email did not arrive to my Inbox.

### Feedback on Assignments:

Feedback will be available as soon as possible after the due date, including the late submission date/time. Answer key will be discussed in lecture sessions and/or shared via Blackboard.

## Grading Scale

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the following chart. (Other classes might assign grades differently: Please be sure to understand the different grading scales in all of your classes.)

<b>Points/Percentage</b>	<b>Letter Grade</b>	<b>Grade Points</b>	<b>Interpretation</b>
93 and up	A	4.00	A range denotes excellent performance
90 – less than 93	A-	3.70	
87 – less than 90	B+	3.30	
83 – less than 87	B	3.00	B range denotes good performance
80 – less than 83	B-	2.70	
77 – less than 80	C+	2.30	
73 – less than 76	C	2.00	C range denotes satisfactory performance
70 – less than 73	C-	1.70	
67 – less than 70	D+	1.30	
63 – less than 67	D	1.00	D range denotes unsatisfactory performance
60 – less than 63	D-	0.70	
0 – less than 60	F	0.00	

## Assignments

List of grading assignments/components and values toward the final letter grade are shown below. Homework/programming assignment due dates will be announced in class and/or made available via Blackboard. Similarly, the dates for Quiz and Exam will also be announced in class and/or made available via Blackboard.

<u>Grading Assignments/Components</u>	<u>Values</u>
Class Performance (random, individual)	10%
Homework (five of six, individual)	15%
Quiz (two of three, 30-minute, individual)	16%
Exam-1 (65-minute, individual)	20%
Project (one, teamwork)	14%
Exam-2 (cumulative, 65-minute, individual)	25%

## **Late Assignments**

For homework assignments, late submissions will not be accepted after five days from the original due date/time. Exceptions include documented emergency situations and prior consents.

## **Missed Tests and Labs/Projects**

Makeup for missed tests (Quiz and Exam) and Labs/Projects will be given only when there is a genuine reason, with clear proof. It is students' responsibility to provide the proof; if the reason for missing a test is illness, a doctor's note will be required. Students should contact the instructor before any makeup test.

## **Teaching Assistants**

### **Grading TA:**

Name <email>: TBD <tbd@shockers.wichita.edu>

Office Hours/Room: TBD

The Grading TA (if any) should grade test papers. The TAs are not allowed to solve any problem for students. If students have any questions regarding the course materials and/or assignments, they should immediately contact the course instructor.

## **Syllabus Policies and Student Resources**

All students should familiarize themselves with the course-related policies and student resources that can be found at: [www.wichita.edu/syllabuspolicies](http://www.wichita.edu/syllabuspolicies)

These include, but may not be limited to:

- Academic Integrity
- CARE Team
- Concealed Carry Policy
- Counseling and Prevention Services
- COVID-19 Conditions
- Heskett Center and Campus Recreation
- Definition of a credit hour
- Disability Services
- First Generation Students
- Important Academic Dates
- Inclusive Excellence and Respect for Diversity
- Intellectual Property
- Names and Pronouns
- Shocker Alert System
- Student Health Services
- Title IX

- Video and Audio recording

## **Students with Disabilities**

A disability is something that affects a major life activity. These life activities include, but are not limited to, learning, walking, breathing, hearing, and seeing, in addition to many other physical, sensory functions, and psychological disabilities.

If you are a student with a disability, or believe you might have a disability, which requires accommodation, please contact the Office of Disability Services (ODS) [www.wichita.edu/ods](http://www.wichita.edu/ods) to discuss reasonable and appropriate accommodation and eligibility requirements. It is the University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability ODS will review your concerns and determine, with you, what academic accommodations are necessary and appropriate for you. For example, adaptations of teaching methods, class materials or testing may be made on a case-by-case basis if warranted, as required by the Americans with Disabilities Act (ADA). All information and documentation about your disability is confidential and will not be released by ODS without your written permission.

## **Respect for Diversity**

Wichita State University is committed to being an inclusive campus that reflects the evolving diversity of society. To further that goal, Wichita State University does not discriminate in its employment practices, educational programs or activities on the basis of age (40 years or older), ancestry, color, disability, gender, gender expression, gender identity, genetic information, marital status, national origin, political affiliation, pregnancy, race, religion, sex, sexual orientation, or status as a veteran. Retaliation against an individual filing or cooperating in a complaint process is also prohibited.

Students from all diverse backgrounds and perspectives are welcome in this Course and the diversity that students bring to this course should be viewed as a resource, strength and benefit. All materials and activities are presented with the intent to be respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups.

## **Laboratory Information**

Programming in C++ is a must for coding in this course. There is a teaching lab associated with this course to provide support so that students can perform the programming assignments. Students on this course may also access BeoShock, the high-performance computing (HPC) cluster at WSU, for their programming needs. Information about BeoShock (such as how to log in and how to run C++ code) will be provided via lectures. The Computer Architecture and Parallel Programming Laboratory (CAPPLab) at 312 Wallace Hall may provide additional help.

## Brief List of Topics to Cover

1. ECE 396: Introduction to Hardware Security
  - a) Syllabus and Knowledge-Probe
  - b) Computer Attacks: Hardware Security and Trust
2. Integrated Circuits and Systems
  - a) Digital Logic, Circuit Theory, ASIC, FPGA, PCB
  - b) Embedded Systems, Internet of Things (IoT)
3. Hardware Trojans
  - a) Hardware Trojan Structures: Designing SoC and FPGA
  - b) Hands-on Experiments: Hardware Trojan Attacks
4. Computer Attacks
  - a) Invasive and Non-invasive Attacks
  - b) Side-Channel Attacks
5. Trust Issues
  - a) Hardware Intellectual Property (IP)
  - b) Hardware Trojan Detection and Prevention
6. Hardware Security Primitives
  - a) Physical Unclonable Function (PUF)
  - b) True Random Number Generator
7. Secure Architecture and Systems
  - a) Secure Processor Architecture
  - b) Secure Distributed Systems

## Tentative Schedule

Week	Note	Important topics/readings, assignments, due dates, and reminders are listed here so that you can organize your time and academic work.
1	😊	ECE 396: Introduction to Hardware Security Syllabus – HW, Grading; K-probe; Hardware Security and Trust
2	HW-1	Hardware Security; HW Assignment; HW-1 (Blackboard)
3	HW-2	Integrated Circuits and Systems: Digital Logic, Circuit Theory, ASIC, FPGA, PCB; HW-2 (Blackboard); <b>Quiz-1 discussion</b>

Week	Note	Important topics/readings, assignments, due dates, and reminders are listed here so that you can organize your time and academic work.
4	Quiz-1	Projects; Quiz-1 (class test, 30m/30p, closed book)
5	Update	ICs and Systems: Embedded Systems, Internet of Things (IoT)
6	HW-3	Hardware Trojan Structures: Designing SoC and FPGA HW-3 (Blackboard); Project Discussion
7	HW-4	Hardware Trojans: Hands-on Experiments: Hardware Trojan Attacks HW-4 (Blackboard); Quiz-2 discussion
8	Quiz-2	Computer Attacks: Invasive, Non-invasive, and Side-Channel Attacks Quiz-2 (class test, 30m/30p, closed book); Exam-1 discussion
9	Break	Semester Break (No Classes)
10	Exam-1	EXAM-1 (class test, 65 minutes, 65 points, Closed book)
11	Update	Trust Issues: Hardware Intellectual Property (IP) Projects Discussion
12	HW-5	Trust Issues: Hardware Trojan Detection and Prevention HW-5 (Blackboard); Projects Discussion
13	HW-6	Hardware Security Primitives: Physical Unclonable Function (PUF) HW-6 (Blackboard); Quiz-3 discussion; Projects Discussion
14	Quiz-3	Hardware Security Primitives: True Random Number Generator Quiz-3 (class test, 30m/30p, closed book); Exam-2 discussion
15	Project Submit	Secure Architecture and Systems: Secure Processor Architecture Secure Architecture and Systems: Secure Distributed Systems
16	Exam-2	EXAM-2 (class test, 65 minutes, 65 points, Closed book)
Finals		None!
Note: The schedule is based on a 16-week semester, with a semester break in Week 9.		

1) May 17, 2025; prepared for spring 2026 term; DRZ

## Definition of a Credit Hour

*Example for 3 credit hour class:* Success in this 3 credit-hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

*Go to 4.08 / Definition and Assignment of Credit Hours for the policy and examples for different types of courses and credit hour offerings.*