

OU CS 5970 Principles and Design of IoT Systems

Spring 2026 Syllabus

1. Instructor:

Dr. Song Fang (songf@ou.edu)

Office hour: W 2:00 pm - 3:00 pm in DEH 232

Class meetings: MWF 9:00 am - 9:50 am

Class location: Carson Engr Ctr 0121

2. Prerequisites

CS 3113 Operating Systems or permission of instructor

3. Course Description

Official course description: Prerequisite: CS 3113 or permission of instructor. This course introduces the fundamental principles and practical design of secure Internet-of-Things (IoT) systems. Students will learn about the overall architecture of IoT ecosystems, the roles of sensors and actuators, methods for fusing data from heterogeneous sources, core security and privacy challenges in IoT, traffic analysis, and applications in smart home devices, automotive systems, and drones.

Extended version: This class covers the theory and practice of secure Internet-of-Things (IoT) systems. Students will be exploring the design and analysis of emerging IoT systems, such as drones, surveillance cameras, voice assistants, smart home light builds, self-driving cars, and implantable medical devices. The instructor will provide lectures on a set of pre-selected topics. Teams of students will work on a collaborative project for the semester. Students can form teams, each with up to three members, based on common interests and/or complementary skills. Each team will select a topic of interest within the scope of the class and develop a project addressing a real-world security or privacy issue in IoT systems.

4. Learning Outcomes

By the end of this course, students will be able to:

- Understand concepts, issues, principles, and mechanisms in IoT systems such as general IoT architecture, constituent parts, security policies, security issues in varying practical scenarios, and privacy concerns associated with IoT applications;
- Obtain hands-on skills in securing practical IoT systems;
- Learn recent research advances in IoT, and prepare for graduate research in IoT security and privacy.

Learning objectives: understanding general IoT architecture, and real-world security and privacy vulnerability; mastering IoT software and network security; being familiar with IoT device security; being able to determine appropriate mechanisms to secure IoT systems and protect privacy.

5. Student Learning Activities and Assessment:

During the semester, students will have:

- Multiple in-class quizzes;
- Three labs;
- Multiple research paper summaries;
- An in-class presentation of a research topic or paper;
- One semester project.

Quizzes aims to test students' understanding of IoT concepts; labs provides students opportunities to implement IoT security and privacy mechanisms; research paper summaries enable students to learn the latest advancement in IoT; an in-class presentation helps test students' understanding of scientific papers and also practice their presentation skills; one semester project trains students to think about secure IoT system design, learn to collaborate with others, and write clear and well-organized technical reports.

6. Recommended Textbook:

There is no required textbook for the class. We will use recent research papers published on prestigious cybersecurity conferences (e.g., ACM CCS, IEEE S&P, Usenix Security, and NDSS) and journals (e.g., IEEE Transactions on Dependable and Secure Computing) for some of the topics. The following textbooks are suggested.

Charles P. Pfleeger, Shari Lawrence Pfleeger, and Lizzie Coles-Kemp, *Security in Computing, 6th Edition*, 2023.

Wenliang Du. *Computer Security: A Hands-on Approach*. 3rd Edition, 2022.

7. Tentative Weekly Schedule:

(These will be adjusted based on the actual progress in a semester.)

	Reading	Topics
Week 1	Pfleeger Chapter 1	Course Introduction; Embracing IoT Systems
Week 2	Pfleeger Chapter 2	Summary of Available Sensors
Week 3	Du Chapter 1	Parts of IoT Systems
Week 4	Du Chapters 4-5	Communication interfaces
Week 5	Pfleeger Chapter 6	Secure IoT System Design I
Week 6		Secure IoT System Design II
Week 7	Pfleeger Chapter 8	Firmware analysis
Week 8		Protocols (REST, MQTT, OAuth)
Week 9		<i>Spring Vacation (No class)</i>
Week 10	Du Chapters 17-18	Hardware Security; Hardware trojans
Week 11		Intellectual property (IP) piracy and integrated circuit (IC) overbuilding; Side-channel analysis
Week 12	Pfleeger Chapter 9	Smart Home

Week 13		Smart City; Research paper presentation
Week 14		Other Emerging Topics; Research paper presentation
Week 15		Final Projects Presentations
Week 16		Final Projects Presentations Continued

8. Grading:

Quizzes	10%
Homework assignment	20%
Summary of reading papers	20%
In-class paper presentation	20%
Course research project	30%

Homework assignments, paper summaries, and project report must be typed using a text editor. Grading scale: The scale for final letter grades is as follows, using standard notation for ranges: A (100+,90]; B (90,80]; C (80,70]; D (70,60]; F (60,0].

9. Policies on Late Assignments:

Homework, paper summaries, project deadlines will be hard. For each day a submission is late - up to a maximum of 3 days, the grade is reduced 15%. For example, if you submit a 90%-correct assignment 2 days late, your overall assignment score will be 60%.

10. Policies on Absences and Scheduling Makeup Work:

I do not take attendance in class, while quizzes and paper presentations will be scheduled during the class meeting time and they should be done in person.

There will be no makeups for homework assignments. Make-up exams will not normally be permitted, and they are only available when required by University policy.

11. Generative AI Policy:

I hope that this course aids you in a creative exploration of Generative AI tools and how they can be used to assist you in accomplishing the goals of this course. In this course, you:

- May use any free Generative AI tools, including those provided to you by the university, such as [Copilot](#) and AI tools with [Adobe Creative Cloud](#) (available in campus computer labs). This will allow everyone in the course to have the same access to Generative AI.
- Are expected to cite your usage of Generative AI, including any direct quotes or paraphrasing of ideas/content generated by AI, per our class's citation guidelines.
- Must provide a statement at the end of the assignment about your Generative AI usage. This statement should be created without the use of Generative AI and should be your own reflection. This statement must include: the platform(s) and prompt(s) you used, a summary of how Generative AI helped you achieve the learning objectives of the course

associated with this assignment, and what additional work you did to verify the output, and to make the work your own.

To implement this policy, we will have ongoing discussions in class about effective use of Generative AI and how you are using it. You'll be asked to reflect frequently about AI usage both in-class and as part of your assignment submission (see assignment instructions for specifics), where you may also be asked to share your prompts, screenshots of your chats with Generative AI tools, and how you used Generative AI to prepare you to, by the end of the semester, independently (without the use of Generative AI) achieve the learning objectives of this course.

If you have any questions about this policy, please talk with me.

Consequences for Violating the Generative AI Usage Policy: Deviating from the acknowledgement, citation, and reflection guidelines described here may be considered a violation of the academic integrity policy of this course. Per our usage policy, you will be responsible for accuracy, including appropriately citing and summarizing any articles you find through AI research tools, and thus must read the material you are citing. Submitting data or research that is not real (a risk when overly relying on Generative AI) may result in an academic integrity violation for falsifying information. Additionally, there may be times, such as in-class quizzes, midterms, or finals, where Generative AI usage is prohibited. Any use of AI in those cases will be considered a violation of the academic integrity policy.

My Use of Generative AI: I will model appropriate Generative AI usage by clearly disclosing when I use it and why. Expected use cases include: revising quiz or exam questions and responses (with my oversight), drafting case studies or educational games to help connect our course topics to the real-world, using my notes and previous PowerPoints to improve the structure of my lectures so that they are clearer to you all as students, graphic design, revising assignment instructions and rubrics to improve clarity for students, receiving feedback on how I communicate with students, and using AI research tools to find current articles to update our course readings. I will never use Generative AI to grade your work.

12. Student Evaluations

The College of Engineering utilizes student ratings as one of the bases for evaluating the teaching effectiveness of each of its faculty members. The results of these forms are important data used in the process of awarding tenure, making promotions, and giving salary increases. In addition, the faculty uses these forms to improve their own teaching effectiveness. The original request for the use of these forms came from students, and it is students who eventually benefit most from their use. Please take this task seriously and respond as honestly and precisely as possible, both to the machine-scored items and to the open-ended questions.

University Policies

Mental Health Support Services

Support is available for any student experiencing mental health issues that are impacting their academic success. Students can either be seen at the University Counseling Center (UCC) located on the second floor of Goddard Health Center or receive 24/7/365 crisis support from a licensed mental health provider through [TimelyCare](#). To schedule an appointment or receive more information about mental health resources at OU please call the UCC at 405-325-2911 or visit [University Counseling Center](#). The UCC is located at 620 Elm Ave., Room 201, Norman, OK 73019.

Copyright Syllabus Statement for In-Person or Online Courses

Sessions of this course may be recorded or live-streamed. These recordings are the intellectual property of the individual instructors and may not be shared or reproduced without the explicit, written consent of the faculty member. In addition, privacy rights of others such as students, guest lecturers, and providers of copyrighted material displayed in the recording may be of concern. Students may not share any course recordings with individuals not enrolled in the class, or upload them to any other online environment.

Title IX Resources and Reporting Requirement

The University of Oklahoma faculty are committed to creating a safe learning environment for all members of our community, free from sex-based discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking, in accordance with Title IX. There are resources available to those impacted, including: speaking with someone confidentially about your options, medical attention, counseling, reporting, academic support, and safety plans. If you have (or someone you know has) experienced any form of sex-based discrimination or violence and wish to speak with someone confidentially, please contact [OU Advocates](#) (available 24/7 at 405-615-0013) or [University Counseling Center](#) (M-F 8 a.m. to 5 p.m. at 405-325-2911).

Because the University of Oklahoma is committed to the safety of you and other students, and because of our Title IX obligations, I, as well as other faculty, Graduate Assistants, and Teaching Assistants, are mandatory reporters. This means that we are obligated to report sex-based violence that has been disclosed to us to the Institutional Equity Office. This means that we are obligated to report sex-based violence that has been disclosed to us to the Institutional Equity Office. This includes disclosures that occur in: class discussion, writing assignments, discussion boards, emails and during Student/Office Hours. You may also choose to report directly to the Institutional Equity Office. After a report is filed, the Title IX Coordinator will reach out to provide resources, support, and information and the reported information will remain private. For more information regarding the University's Title IX Grievance procedures, reporting, or support measures, please visit [Institutional Equity Office](#) at 405-325-3546.

Adjustments for Pregnancy and Related Issues

Should you need modifications or adjustments to your course requirements because of pregnancy or a pregnancy-related condition, please request modifications via the [Institutional Equity Office](#) website or call the Institutional Equity Office at 405/325-3546 as soon as possible. Also, see the Institutional Equity Office [FAQ on Pregnant and Parenting Students' Rights](#) for answers to commonly asked questions.

Reasonable Accommodation Policy

The University of Oklahoma (OU) is committed to the goal of achieving equal educational opportunity and full educational participation for students with disabilities. If you have already established reasonable accommodations with the Accessibility and Disability Resource Center (ADRC), please log into iAdvise to request your semester accommodations as soon as possible and contact me privately, so that we have adequate time to arrange your approved academic accommodations.

If you have not yet established services through ADRC, but have a documented disability and require accommodations, please complete [ADRC's pre-registration form](#) to begin the registration process. ADRC facilitates the interactive process that establishes reasonable accommodations for students at OU. For more information on ADRC registration procedures, please review their [website](#). You may also contact them at (405)325-3852 or adrc@ou.edu, or visit www.ou.edu/adrc for more information.

Note: disabilities may include, but are not limited to, mental health, chronic health, physical, vision, hearing, learning and attention disabilities, pregnancy-related. ADRC can also support students experiencing temporary medical conditions.

Religious Observance

It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty. [\[See Faculty Handbook 3.15.2\]](#)

Final Exam Preparation Period

Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy please refer to OU's [Final Exam Preparation Period policy](#).

Emergency Protocol

During an emergency, there are official university [procedures](#) that will maximize your safety.

Severe Weather: If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather.

1. Look for severe weather refuge location maps located inside most OU buildings near the entrances.
2. Seek refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building.
3. Go to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows.
4. Get in, Get Down, Cover Up
5. Wait for official notice to resume normal activities.

Additional [Weather Safety Information](#) is available through the Department of Campus Safety.

The University of Oklahoma Active Threat Guidance

The University of Oklahoma embraces a Run, Hide, Fight strategy for active threats on campus. This strategy is well known, widely accepted, and proven to save lives. To receive emergency campus alerts, be sure to update your contact information and preferences in the account settings section at one.ou.edu.

RUN: Running away from the threat is usually the best option. If it is safe to run, run as far away from the threat as possible. Call 911 when you are in a safe location and let them know from which OU campus you're calling from and location of active threat.

HIDE: If running is not practical, the next best option is to hide. Lock and barricade all doors; turn off all lights; turn down your phone's volume; search for improvised weapons; hide behind solid objects and walls; and hide yourself completely and stay quiet. Remain in place until law enforcement arrives. Be patient and remain hidden.

FIGHT: If you are unable to run or hide, the last best option is to fight. Have one or more improvised weapons with you and be prepared to attack. Attack them when they are least expecting it and hit them where it hurts most: the face (specifically eyes, nose, and ears), the throat, the diaphragm (solar plexus), and the groin.

Please save OUPD's contact information in your phone.

NORMAN campus: *For non-emergencies call (405) 325-1717. For emergencies call (405) 325-1911 or dial 911.*

TULSA campus: *For non-emergencies call (918) 660-3900. For emergencies call (918) 660-3333 or dial 911.*

Fire Alarm/General Emergency

If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates:

1. *LEAVE* the building. Do not use the elevators.
2. *KNOW* at least two building exits

3. *ASSIST* those that may need help
4. *PROCEED* to the emergency assembly area
5. *ONCE* safely outside, *NOTIFY* first responders of anyone that may still be inside building due to mobility issues.
6. *WAIT* for official notice before attempting to re-enter the building.

[OU Fire Safety on Campus](#)

**Every part of this syllabus is subject to adjustment as the semester progresses. If you are dissatisfied with the course policies, grading, and assignments, please contact the instructor. Reasonable requests for modifications may be accommodated at the instructor's discretion. Note that any changes I might make will fall within the limits of university policy.*