

# CS47500 Human-Computer Interaction

**Instructor:** Tianyi Zhang, Assistant Professor of Computer Science

**Email:** [tianyi@purdue.edu](mailto:tianyi@purdue.edu)

**Lecture:** Tue & Thurs 3pm-4:15pm @ University Hall 201

**Office Hours:** Tue & Thurs 4:30pm-5:30pm @ LWSN 3154H

**TA:** WeiHao Chen

**Email:** [chen4129@purdue.edu](mailto:chen4129@purdue.edu)

**Office Hours:** Wed 10am-12pm @TBD (or on Zoom by appointment)

**Instructional Modality:** Face-to-Face

**Course Credits:** 3.0

**Prerequisites:** [CS25100](#) with a minimum grade of C

## Course Description

The goal of this course is to teach students how to design useful and usable interactive systems that address important needs of people. Students will experience the entire design life cycle, from need finding to usability evaluation. Topics covered in the course include user-centered design principles, usability heuristics, need-finding methods such as semi-structured interviews and contextual inquiry, quick prototyping techniques, usability evaluation methods such as with-subjects user study and A/B testing, and theories about user interaction and decision making. As we are entering a new era of AI, we will also explain how to apply those HCI principles and techniques to AI-powered systems in the last few weeks.

This course is project-based. Students will form project teams among themselves to work on a semester-long project and apply the user-centered design principles, theories, and techniques that they have learned in class to build a useful and usable interactive system such as a mobile application. You can work on any project ideas that solve a real-world problem. While you will not be asked to fully implement the system, you should expect to implement a high-fidelity prototype using [Figma](#) and conduct user studies with the prototype.

This course is highly interactive. There will be a series of design studios and in-class activities that require active participation, communication, and discussion with other students. Your class participation will take 10% of your final grade. Note that only attending all classes does not mean you will get full credits of class participation. You are expected to actively engage in the in-class activities and discussions.

## Learning Outcomes

After successful completion of this course, a student will be able to:

- Apply HCI methods such as semi-structured interviews and contextual inquiries to uncover user needs and realistic problems that can be solved by computational methods
- Apply user-centered design principles to iteratively develop interface designs to address those needs
- Develop prototypes to concretize a design idea in different levels of fidelity
- Critique a design idea or prototype and pinpoint design flaws and usability issues based on commonly agreed upon design principles and usability heuristics
- Iteratively evaluate and improve upon the prototypes based on feedback from potential users
- Communicate your design ideas and findings to target users, other designers, funders, etc.
- Work in a team and succeed

### Textbooks, Learning Resources, and Technology

No textbook is required. If you are interested, we recommend reading one of the following books.

- Norman, D. (2013). *The Design of Everyday Things: Revised and Expanded Edition*. Basic Books.
- Sharp, H., Preece, J., Rogers, Y. (2015). *Interaction Design: Beyond Human-Computer Interaction 4th Edition*. John Wiley & Sons.
- Shneiderman, B., Plaisant, C., Cohen, M. S., Jacobs, S., Elmqvist, N., & Diakopoulos, N. (2016). *Designing the User Interface: Strategies for Effective Human-Computer Interaction*. Pearson.

Other HCI and UX learning resources:

- Articles from the Nielsen Norman Group ([link](#))
- The Ultimate Guide to Understanding UX Roles and Which One You Should Go For ([link](#))
- The Encyclopedia of Human-Computer Interaction ([link](#))
- Three levels of UX Research impact ([link](#))
- Method Podcast from Google Design ([link](#))

Check [articles](#) from UX Research and UI Design from Nielsen Norman Group.

We will use [Figma](#) to create digital mock-up designs in course projects.

We will use Piazza to make announcements, send reminders, ask & answer questions, look for teammates, etc. Please join our Piazza workspace via [this link](#).

All lecture slides, assignment instructions, and other materials will be posted on [Purdue BrightSpace](#).

### Grading

**Class Participation:** 10%

**Weekly individual/team assignments:** 60% (5% each week for 12 weeks)

**Project milestones:** 30% (Milestone 0: 2%, Milestone 1-3: 6% each, Milestone 4: 10%)

### Course Schedule

|           | Topic  | Assignments   | Project Milestones  |
|-----------|--|---|---|
| Tue 1/10  | Introduction & Course Overview                             | <b>Individual:</b> Initial project ideas (due on Sunday, Jan 22 at midnight)  |   |
| Thur 1/12 | User-centered Design                                       |   |   |
| Tue 1/17  | Need-finding Methods: Interviews                           |   |   |
| Thur 1/19 | Need-finding Methods: Observations and Surveys             |   |   |
| Tue 1/24  | <b>In-class Activity: Pitch Initial Ideas to the Class</b> |   | Milestone 0: Team Formation and Project Proposal (due Sunday, Jan 29 at midnight) |
| Thur 1/26 | Ethics, Privacy, and IRB of Human Studies                  |   |   |
| Tue 1/31  | Qualitative Data Analysis                                  | <b>Team:</b> Draft the interview protocol (due on Sunday, Feb 5 at midnight)  |   |
| Thur 2/2  | Personas, Usage Scenarios, Storyboarding                   |   |   |
| Tue 2/7   | <b>In-class Activity: Mock Interviews</b>                  | <b>Individual:</b> Complete ethics training at <a href="#">CITI Program</a> (due on Sunday, Feb 12 at midnight)                       |   |
| Thur 2/9  | Low-fidelity and High-fidelity Prototyping                 |   |   |
| Tue 2/14  | Figma Tutorial   | <b>Individual:</b> Conduct interviews with two target users, take notes, and write a brief report (due on Sunday, Feb 19 at midnight) |   |

|           |  |   |   |
|-----------|--|---|---|
| Thur 2/16 | Visual Design Principles                                   |   |   |
| Tue 2/21  | User Mental Models   | <b>Team:</b> Affinity diagramming and storyboarding (due on Sunday, Feb 26 at midnight) | Milestone 1: Need-finding study report (due Sunday, Feb 26 at midnight) |
| Thur 2/23 | Data Visualization   |   |   |
| Tue 2/28  | Usability Heuristics for User Interface Design             | <b>Team:</b> Paper prototyping (due on Sunday, Mar 5 at midnight)                       |   |
| Thur 3/2  | Design for Accessibility, Diversity, and Equity            |   |   |
| Tue 3/7   | Usability Evaluation: Inspections and Qualitative Methods  | <b>Team:</b> Digital prototyping (due on Sunday, Mar 19 at midnight)                    |   |
| Thur 3/9  | <b>In-class Activity: Hallway Testing</b>                  |   |   |
| Tue 3/14  | <b>No Class (Spring Vacation)</b>                          |   |   |
| Thur 3/16 | <b>No Class (Spring Vacation)</b>                          |   | Milestone 2: Prototype design report (due Sunday, Mar 19 at midnight)   |
| Tue 3/21  | Usability Evaluation: Controlled Lab Study and Field Study | <b>Team:</b> Cognitive Walkthrough (due on Sunday, Mar 26 at midnight)                  |   |
| Thur 3/23 | Usability Evaluation: Web Analytics and A/B Testing        |   |   |
| Tue 3/28  | Usability Evaluation: Data Analysis and Hypothesis Testing | <b>Team:</b> Digital prototyping revision (due on Sunday, Apr 2 at midnight)            |   |
| Thur 3/30 | Frontiers in HCI Research                                  |   |   |

|           |                                     |  |   |
|-----------|-------------------------------------|--|---|
| Tue 4/4   | HCI and VR/AR                       | <b>Team:</b> User Study Design (due on Sunday, Apr 9 at midnight)  |   |
| Thur 4/6  | Usable Security and Privacy         |  |   |
| Tue 4/11  | Human-Centered AI                   | <b>Individual:</b> Conduct user study with four participants, take notes, and write a brief report (due on Sunday, Apr 17 at midnight) |   |
| Thur 4/13 | Interaction Design for AI (Part I)  |  |   |
| Tue 4/18  | Interaction Design for AI (Part II) | <b>Team:</b> Analyze user study data (due on Sunday, Apr 23 at midnight)   |   |
| Thur 4/20 | AI Ethics and Fairness              |  | Milestone 3: User study report (due on Sunday, Apr 23 at midnight)                          |
| Tue 4/25  | Final Project Presentation          |  |   |
| Thur 4/27 | Final Project Presentation          |  | Milestone 4: Tool demo video and final project report (due on Wednesday, May 4 at midnight) |

### Course Project

This course is centered around a semester-long, team-based project. Through this project, students will get first-hand experience of applying user-centered design principles and methods in creating a high-fidelity prototype of a web/mobile application. Students can work on any project idea that aims at solving a real-world problem.

Students will be asked to form teams of 3-5 to complete the course project together. The course is structured in a way that in each week, individual students and/or the team is asked to complete some project-related tasks. Completing these tasks in a timely fashion will ensure that the team's design progress is on track and can deliver project milestones on time. Students will be asked to submit the outcome of these tasks via BrightSpace. After project teams are formed (Week 3), students are expected to meet their teammates online or in-person each week and document their

progress, TODO tasks, questions, or challenges they are facing in a Google Doc. The TA will check the Google Doc each week and give advice and feedback.

Students in the same team will not always receive the same grades, and project grades will account for individual effort and contribution. At the end of this course, students will rate the effort and contribution of their team members, as well as the quality of projects for other teams. The ratings will be provided anonymously through Google Forms. The teaching team will consider the peer feedback when assigning individual grades.

Here is the list of weekly tasks:

- **Week 1-2:** Initial project ideas (individual)
- **Week 3:** Reach out to other students, form a team, and write a one-page project proposal (as part of Milestone 0)
- **Week 4:** Draft the interview protocol (team)
- **Week 5-6:** Complete ethics training (individual); Revise the interview protocol (team) and conduct interviews (individual)
- **Week 7:** Apply affinity diagramming to interview transcripts and identify personas, needs, and usage scenarios (as part of Milestone 1)
- **Week 8:** Create a paper prototype (team)
- **Week 9-10:** Revise paper prototype based on user feedback from the in-class hallway testing and start creating a digital prototype using Figma (team)
- **Week 11:** Draft a cognitive walkthrough from and continue to work on the digital prototype (team)
- **Week 12:** Revise the digital prototype based on user feedback from the hallway testing results (team); Write a report about the final prototype design (as part of Milestone 2)
- **Week 13:** Draft a user study design (team)
- **Week 14:** Conduct user studies with four participants (individual)
- **Week 15:** Analyze user study data (team); Write the user study report (as part of Milestone 3)
- **Week 16:** Prepare for the project presentation, create a tool demo video, and write the final project report (as part of Milestone 4)

The teaching team will remind students of the weekly tasks via Piazza. These weekly tasks will be graded on completeness.

In addition, each team is asked to submit five project milestones:

- **Milestone 0:** Team formation and project proposal report
- **Milestone 1:** Need-finding report
- **Milestone 2:** Prototype design report
- **Milestone 3:** User study report
- **Milestone 4:** Tool demo video and final project report

More detailed instructions on project milestones can be found in the guidelines for each milestone.

## Policies

### **Attendance**

This course follows Purdue's academic regulations regarding attendance, which states that students are expected to be present for every meeting of the classes in which they are enrolled. While we will not check attendance in each class, we will use other ways such as class discussion to check your attendance and participation in the class. Your final grade will depend on your participation in the class. Please come to the class continuously, read the assigned papers, and participate in discussions.

If you feel sick, have any symptoms associated with COVID-19, or suspect you have been exposed to the virus, you should stay home and contact the [Protect Purdue Health Center](#). Please also notify the instructor so that the instructor can arrange remote participation for you. If you miss classes because of COVID-related reasons, your final grade will not be affected by your absence of classes. For more guidance on class attendance related to COVID-19 are outlined in the [Protect Purdue Pledge for Fall 2021](#) on the Protect Purdue website.

For other conflicts or absences, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor's department because of circumstances beyond the student's control, and in cases falling under excused absence regulations, the student or the student's representative should contact or go to the [Office of the Dean of Students website](#) to complete appropriate forms for instructor notification. Under academic regulations, excused absences may be granted for cases of grief/bereavement, military service, jury duty, and parenting leave. For details, see the [Academic Regulations & Student Conduct section](#) of the University Catalog website.

### **Missed or Late Work**

For weekly assignments and Milestone 0-3 reports, late submissions will be accepted for up to 3 days with 15% decaying credit per day. Late submissions for the final project report are not allowed. Exceptions will be made for medical reasons (doctor's note required).

### **Academic Dishonesty**

*Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, Student Regulations] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]*

Please read the departmental [academic integrity policy](#) and [Purdue's student guide for academic integrity](#). This will be followed unless we provide written documentation of exceptions.

- Unless stated otherwise, each student should write up their own solutions independently. You need to indicate the names of the people you discussed a problem with; ideally you should discuss with no more than two other people.
- **No part of the student's assignment shall be copied from another student** (Plagiarism). We encourage you to interact amongst yourselves: you may discuss and obtain help with basic concepts covered in lectures or the textbook, homework specification (but not solution), and program implementation (but not design). However, unless otherwise noted, work turned in should reflect your own efforts and knowledge. Sharing or copying solutions is unacceptable and could result in failure. We use copy detection software, so do not copy code and make changes (either from the Web or from other students). You are expected to take reasonable precautions to prevent others from using your work.
- Any student not following these guidelines are subject to an automatic F (final grade).

### **Use of Copyrighted Materials**

*Students are expected, within the context of the Regulations Governing Student Conduct and other applicable University policies, to act responsibly and ethically by applying the appropriate exception under the Copyright Act to the use of copyrighted works in their activities and studies. The University does not assume legal responsibility for violations of copyright law by students who are not employees of the University.*

*A Copyrightable Work created by any person subject to this policy primarily to express and preserve scholarship as evidence of academic advancement or academic accomplishment. Such works may include, but are not limited to, scholarly publications, journal articles, research bulletins, monographs, books, plays, poems, musical compositions and other works of artistic imagination, and works of students created in the course of their education, such as exams, projects, theses or dissertations, papers and articles.*

### **Grief Absence Policy for Students**

*Purdue University recognizes that a time of bereavement is very difficult for a student. The University therefore provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS). GAPS Policy: Students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for misses assignments or assessments in the event of the death of a member of the student's family.*

### **Violent Behavior Policy**

*Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent*



*Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity.*

## **Emergencies**

*In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.*

## **Accessibility and Accommodations**

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: [drc@purdue.edu](mailto:drc@purdue.edu) or by phone: 765-494-1247.

## **Nondiscrimination**

*Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.*

*Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, genetic information, marital status, parental status, sexual orientation, gender identity and expression, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in [Executive Memorandum No. D-1](#), which provides specific contractual rights and remedies. Any student who believes they have been discriminated against may visit [University's website](http://www.purdue.edu/report-hate) (www.purdue.edu/report-hate) to submit a complaint to the Office of Institutional Equity. Information may be reported anonymously.*