

# CS 352: Intro to Usability Engineering



*Welcome*

**Mon-Wed: 12:00 – 1:50 PM**  
**KEC 1003**

**Instructor:** Anita Sarma  
**TA:** Summit Haque

[canvas.oregonstate.edu/courses/199962](https://canvas.oregonstate.edu/courses/199962)  
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“I want you to generate a picture to use for the introduction to my HCI class on: [text from syllabus]. Include scene where students are learning together with AI in creating out of the world, innovative product designs.” [ChatGPT]

# Instructor

Anita Sarma, Professor

**Research area:** HCI, HAI, Software Engineering,  
Computer Science Education, Open-Source Software, Inclusive design

**Research passion:** Make tools and processes that work for all people and not make people work for the tools we build.

**Passion:** The ocean and forest walking

You can address me: Dr. Sarma, Dr. A.

Personal Website: <https://web.engr.oregonstate.edu/~sarmaa/>

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Office: KEC 3067



# Teaching Assistant

Summit Haque

PhD student

**Research area:** Software Engineering

# Today

- What is this class about
- Usability Goals
- Double Diamond design process

# What is this course about?

Human centered design process



# Why Human Centered Design?

Design – how things work & user experiences and interactions with technology

- Not only engineers who know how things work and controlled
- Not only designers who know how people interact and aesthetics



<https://abcnews.go.com/US/infamous-mile-island-nuclear-plant-site-1979-partial/story?id=47722164>

# What you will learn in CS352

- Human centered design process
- Usability guidelines and design principles
- Learn to prototype (sketch and use Figma)
- Basics of conducting usability studies
- Learn to **use responsibly use AI** as your partner
- Active Learning by applying concepts

# Why take this course?

1. High Demand for HCI Skills (23% job growth for UX designers from 2021-2031 [[U.S. Bureau of Labor Statistics](#)])
2. Competitive salaries: 2023 median starting salary is around \$98,000 per year (Glassdoor 2023)
3. Essential for AI and Emerging Technologies: Need professionals who understand how humans interact with AI systems (IEEE, 2022)
4. Impact-Driven Work that Shapes the Future: you will improve lives, from accessible software for disabilities to intuitive medical interfaces that reduce clinician burnout!
5. **Use of AI in class:** Understanding **how to design AI-driven experiences**—including personalization, automation, and ethical considerations—will give you a **competitive edge** in UX, product design, and software development (McKinsey, 2023).

**LinkedIn's 2024 Jobs:** AI UX Designer, Conversational AI Designer, and Human-AI Interaction Specialist



# CS352 Tour

<https://canvas.oregonstate.edu/courses/1999621>

(Canvas)

## Activity (20%)

### Individual

- In class application of concepts that you are learning
- End of day Wednesdays
- Graded and delivery/submission through Canvas, unless otherwise noted
- Lowest 2 dropped

# Term Project (50%)

4—member teams

Each team chooses from one of the applications:

*My term project should help...*

1. ...individuals cope with mental health stressors
2. ...individuals, who have part-time jobs, with time management
3. ...older adults securely manage their passwords
4. ...individuals manage their finances
5. ...parents on budget make tasty, healthy meals for their children
6. ...stressed individuals get good sleep

# Grace days

Life happens!

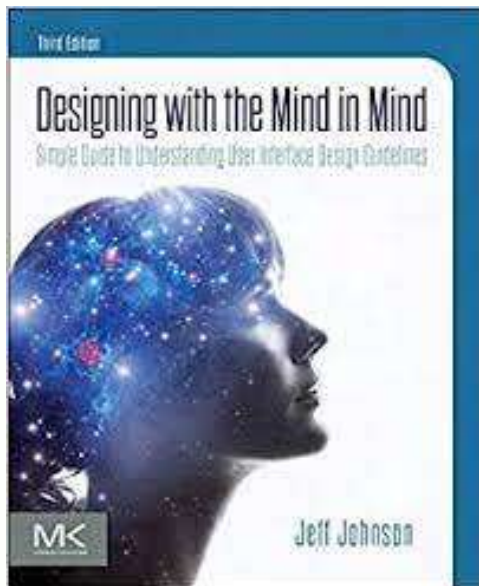
- 10 grace days (max 2 days per graded component of Activity/Project deliverable).
- Any grace days used by an individual also counts for the team. So, if Joe uses 2 days for their “activity”, it counts for the team too...so the team has 8 grace days left.
- So, do communicate with each other

# Teamwork

- Treat each other with respect and professionalism
- Everyone should contribute equally
- *Suggest* that you
  - appoint an unofficial group leader
  - schedule meeting (work times) in your calendar this week
- Plan early, be empathetic, life happens
  - Give your team members time to contribute
- Communicate and resolve conflicts by yourself, but if I need to get involved, let me know early enough
  - Might have differential grading
  - Dissolve the team

# Resources

- Required textbook is available for free (see syllabus)
- Keep up with readings. I will **not be able to cover** everything in lecture/slides.
- Trap Cards



# CS352 Logistics

Quick look at canvas

Questions??

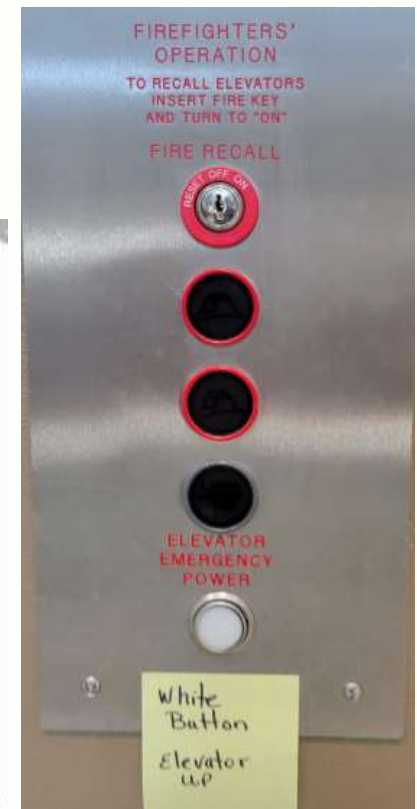
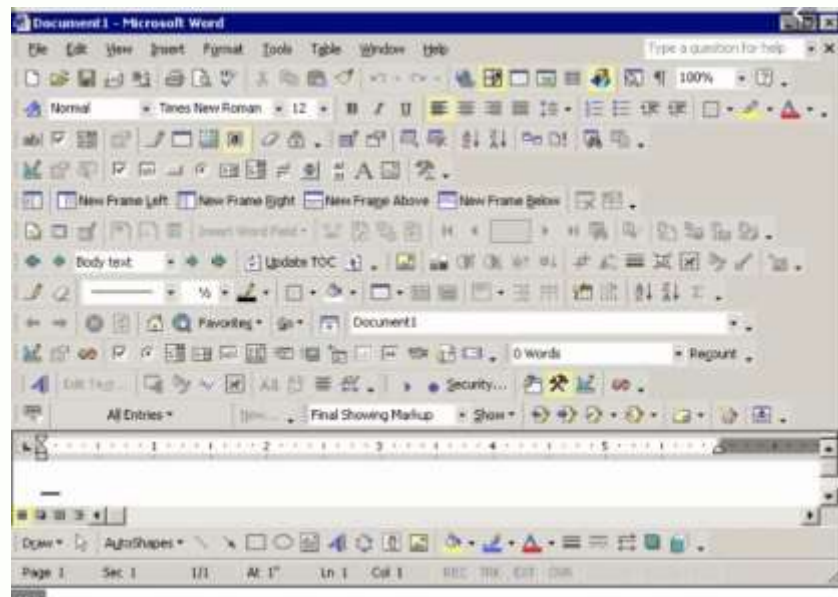
# Usability Goals



# What is Usability Engineering?

Usability Engineering is the process of **Methodically** designing systems which are HCD – Human Centered Design.

- Useful & Usable
- Experiences matter



# Usability goals

0. Effectiveness at task (we assume this to be a given)

1. Utility

2. Safety

3. Learnability

4. Efficiency

5. Memorability

You frame questions to check if the usability goals are met.

# 1. Utility

... the extent to which the product provides the right kind of functionality so users can do what they need or want to do.

Question:

- Does it have functions to allow users to accomplish their tasks in the way they want?

TENET  
UNDERSTANDABLE

TRAP

# INVISIBLE ELEMENT

No cue (label, icon, affordance, or prompt) is provided to signal to the user how to achieve a goal, and the user has insufficient prior learning to overcome its absence.

UI TENETS & TRAPS

## - Invisible Element



## Example

In 2012 Microsoft released Windows 8. Unlike previous versions, Windows 8 removed a visible means to launch the Start Menu. The resulting user confusion led to the Start button's return in the next version of Windows.

## 2. Safety

...protecting the user from dangerous conditions and undesirable situations, also from perceived fear

Question:

- What is the range of errors possible?
- What measures to recover easily from them?

TENET  
COMFORTABLE

TRAP

# ACCIDENTAL ACTIVATION

The system misinterprets a user's physical actions resulting in an unintended outcome.

UI TENETS & TRAPS

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## - Accidental Activation



### Example

With gesture based systems like Kinect, it is often difficult to determine the user's intent: Is a hand gesture a navigational swipe or an effort to scratch one's ear? This makes scrolling via hand gestures prone to accidental activations.

TENET  
FORGIVING

## TRAP IRREVERSIBLE ACTION

The system does not allow the user to undo an action they have taken.

### - Irreversible Action



### Example

In this version of Concur's iOS travel app, pressing the *Reserve* button not only reserved but also purchased the flight, which could not be undone.

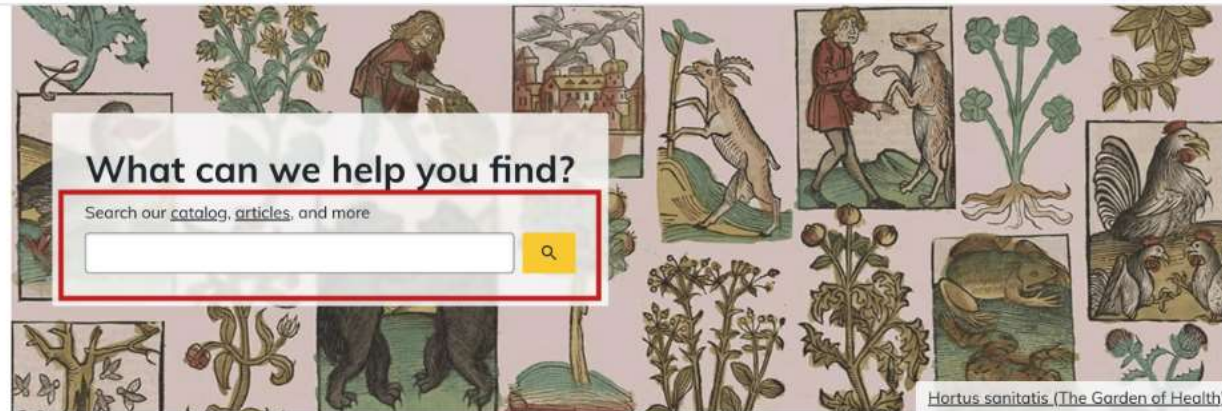
### 3. Learnability

...how easy a system is to learn to use.

#### Questions:

- Can the user figure out the system by exploring
- How hard will it be to learn the whole set of functionality





### Popular databases

<a href="#">PubMed @ U-M</a>	<a href="#">Web of Science</a>
<a href="#">Google Scholar</a>	<a href="#">ProQuest</a>
<a href="#">PsycINFO</a>	<a href="#">WorldCat</a>
<a href="#">JSTOR</a>	<a href="#">EBSCOhost</a>

[View all databases](#)

### Plan your visit

- Hatcher Library TODAY: 8AM - 5PM
- Shapiro Library TODAY: CLOSING AT 6PM
- Art, Architecture, and Engineering Library TODAY: 24 HOURS
- Taubman Health Sciences Library TODAY: 9AM - 5PM

[View all hours, locations, and access details](#)[Ask a Librarian](#) ^

University of Michigan Library's homepage includes two search bars – one for library logistics and the other for academic research. This type of design causes confusion, as users will often use the wrong search bar.

## 4. Efficiency

...way a product supports users in carrying out their tasks

### Question:

- Once a user has learned the system can they sustain a high level of productivity?

TENET  
EFFICIENT

TRAP

# INFORMATION OVERLOAD

Information presented to the user is comprehensible, but there is too much of it.

## - Information Overload

2002

Jeep

### FIND A DEALER

It's easy to locate a dealer. 1. Click and hold box number 1 to select your search by Zip Code, City, Dealership Name or State. 2. Enter the Zip Code, City, or Dealership Name in the box marked number 2. 3. If searching by State only, select the state from the pull-down menu in box number 3. \*\*If choosing to search by city or state, type the city in box2 then select state in the box marked number 3 to make your search complete. 4. Once finished, simply click the "Search" button.



Search by

1 Zip Code

Select a State:

3 choose One

2 Enter Zip Code, City, or Dealership name:

4 SEARCH FOR A DEALER

If you are a member of the U.S. Military, an executive, or a diplomat living outside the U.S., click here for special options.

2007



### FIND A DEALER

Enter Zip

## Example

Back in 2002, the Jeep website had an extremely wordy description explaining how to find the nearest Jeep dealer. By 2007 this issue was fixed.

Credit: Jeff Johnson

TRAP

# UNNECESSARY STEP

When the product is being used as intended, the number of actual or perceived steps required to achieve a goal is too high.

## - Unnecessary Step



## Example

The hamburger menu has become ubiquitous with early mobile design. But companies have discovered that removing it and flattening the hierarchy can increase the efficiency of their UIs. Spotify is a notable example of a company that ditched the hamburger.

## 5. Memorability

...how easy a product is to remember how to use, once learned.

Question :

- What UI support can help users remember how to carry out tasks, especially for infrequent use?

TENET  
UNDERSTANDABLE

TRAP

# MEMORY CHALLENGE

The system requires the user to remember information that is easy to forget.

UI TENETS & TRAPS ©

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## - Memory Challenge

The screenshot shows a web interface for password recovery. At the top, there's a header with a logo and navigation links. Below that, a main heading reads 'Forgot Your Password? Change It Now'. There are four horizontal dashed lines above the heading. The form contains three input fields: 'User ID', 'Security Validation Question', and 'Security Validation Answer'. The 'Security Validation Question' field is highlighted with a blue border.

• Select the same Question and Answer you chose when you created your User ID and Password

## Example

Efforts to make systems secure often make them impossible to use. In this example, American Express required users to remember not only the answer to their security question, but also the security question itself.

# Recap: Goals of Usability Engineering

## Usability goals

1. Utility (how good is it in providing right kind of support)
2. Safety (how well it protects users from...)
3. Learnability (how easy to learn...)
4. Efficiency (how easy to sustain high-level productivity)
5. Memorability (how easy to remember...)



### Type of users

Novice/first time users

Frequent/casual users

Expert users

# How to do: Human Centered Design?





## Double Diamond: Design Process

“Create an out of the world picture that is cute, relevant to pacific northwest. It is about students of different characteristics, species all learning on how to design a complex process. The process has the shape of a double diamond” ChatGPT

# ENGAGEMENT

Connecting the dots and building relationships between different citizens, stakeholders and partners

## DESIGN PRINCIPLES

1. Be People Centered
2. Communicate (Visually & Inclusively)
3. Collaborate & Co-Create
4. Iterate, Iterate, Iterate

CHALLENGE

Discover

Define

Develop

Deliver

OUTCOME

Problem Space

Solution Space

Iterative Process

Explore, Shape, Build

Creating the conditions that allow innovation, including culture change, skills and mindset

# LEADERSHIP



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# The 4 D's of Double Mind

Double Diamond has 4 phases

1. Discover:
2. Define:
3. Develop:
4. Deliver:

# Discover

Objective: Understand problem space and use context

Method: User & market research, interviews, empathy mapping

Class: Contextual inquiry

Outcome: insights into user needs, pain points, opportunity for innovation. Challenge your assumptions.

# Define

Objective: Synthesize insights into clear problem statement and user requirements

Method : Synthesize data -> problem statement; persona, journey mapping ->user requirements

Class: Affinity diagramming, personas, journey maps

Outcome: design brief that provides a focused direction for developing solutions.

# Develop

Objective: Ideate and prototype multiple potential solutions

Method : Ideation, prototyping, evaluation, iteration

Class: Ideation, storyboarding, low-fi prototype, cognitive walkthrough

Outcome: prototypes or preliminary solutions that can be tested and iterated upon..

## Deliver

Objective: Finalize and implement the best solution, and to evaluate its impact

Method : Hi-fi prototype, develop final product, extensive user testing & launch

Class: Figma (hi-fi), heuristic evaluation, User testing

*No need for working product*

Outcome: polished, user-validated product, also includes includes post-launch evaluation.

# ENGAGEMENT

Connecting the dots and building relationships  
between different citizens, stakeholders and partners

## DESIGN PRINCIPLES

1. Be People Centered
2. Communicate (Visually & Inclusively)
3. Collaborate & Co-Create
4. Iterate, Iterate, Iterate

CHALLENGE

Discover

Define

Develop

Deliver

OUTCOME

## METHODS BANK

Explore, Shape, Build

Creating the conditions that allow innovation,  
including culture change, skills and mindset

# LEADERSHIP



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# Activity

- Find your team and select your application

*My term project should help...*

1. ...individuals cope with mental health stressors
2. ...individuals, who have part-time jobs, with time management
3. ...older adults securely manage their passwords
4. ...individuals manage their finances
5. ...parents on budget make tasty, healthy meals for their children
6. ...stressed individuals get good sleep

# Activity

- Find your team and select your application
- Find like-minded folks to create your team (canvas)

Week	Class	Lecture Topic	Readings	In-Class Activity (Individual)
	Mar 31	Usability goals	<a href="#">Rogers, Ch. 1.6.1</a> ↓, <a href="#">Usability Goals</a> ↓ <a href="#">NN/g video on Usability</a> ↗	<u>Term Project Bids:</u>
		Design Process		

To-Do Date: Apr 4 at 11:59pm

Instructions: Find out which of these Applications you want to work as your team project.

Write down your team name. If you are going to use AI for your project, include ai as part of the team name.

Add the full name of your team mates. We will port the name/team to People -> term project.

More details of each of these areas are at the bottom of the table.

Mental Health	Time Management	Secure Passwords (older adults)	Finance Management	Budget Kids Meals	Good Sleep
health.ai [Joe Smith, full name 2, ...]	manageITwell [Jane Doe, full name 2, ...]	CoolName [student names]	CoolName [student names]	CoolName [student names]	CoolName [student names]