Product Design Capstone

MECHENG 4906.01 + 4906.02

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What is ME Product Design Capstone?

Students experience a human-centered design project that emphasizes understanding the users’ needs. Focus on user research to clearly understand a problem before tackling the design challenge.

Max. 24 students, so instructor permission is required to enroll

AU 2022: ME 4906.01
- M + W 12:45-2:05pm [class]
- W 3:00-4:50pm [lab]
- **pre- or corequisite: ME 5682.01

SP2023: ME 4906.02
- 1x/week lab for projects
To take this capstone, you must be enrolled in 5682.01 Product Design Tech Elec!

*credit for 5682.01 in a prior semester is also ok*
Schedule for Product Design Capstone AU 2022

Class Meetings:
Monday & Wednesday
12:45-2:05 pm

Lab Meetings:
Wednesday
3:00-4:50 pm
What’s this capstone’s specialty?

Our focus is on the user-centered design process, and we include many topics that don't typically make it into engineering design classes:

- **Conducting User Research**: go talk to real people! Understand them!
- **Framing the Problem**: work with the people to define the opportunity at hand, and spend a significant amount of time framing the challenge
- **Open-Ended Projects**: you define the project direction & solutions
- **Entrepreneurial Mindset**: developing skills to share your work with non-technical audiences and making idea pitches
How are the projects structured?

- You get to choose many aspects of your project focus
- You get to choose your teammates (teams of 3-4 people)
- Teams start by choosing a user group or project focus—NOT a specific product to design
- Students encouraged to suggest possible project topics

- Funded by department
- *maybe* Opportunity to gain additional funding from Innovation Studio
- 1st semester: focus on research, context, and problem definition
- 2nd semester: generate solutions, emphasis on iteration, lots of prototyping
What will we do during our project?

• Work with users to understand their problems, needs, motivations, context
• Define the opportunity: frame the problem as an engineering challenge to address the users' needs
• Conduct multiple iterations of concept generation, with an emphasis on visual communication
What will we do during our project?

- Prototyping: from quick, cheap mockups to more functional prototypes
- Continually solicit user feedback for continuous improvement
- Focus on entrepreneurial mindset
- *maybe* Pitch your work at the Innovation Studio: communicate a technical idea to a broad audience to solicit feedback and gain funding
What projects have students done in the past?

Teams have worked with...

• **musicians** to improve transport and storage of fragile instruments
• **firefighters** to design a hose management system
• **beekeepers** to design a device to more effectively weigh beehives
• **The Cincinnati Zoo** to develop an enrichment device for Asian Elephants
• **Mid-Ohio Food Bank** to develop a rainwater collection system for urban farms
• ... many more!
Example: On-the-scene shadowing of firefighters at a training exercise
Example: Problem Definition Activities

- Primary Sound & fire = noisy
- Actuating radios = busy
- Communication:
  - Cardinal directions forgotten
  - Lost in house
- Haze
- Not knowing where other FF are

CARRYING BODIES
- Airports caught on sills
- Lack of universal tool (vandalized windows)
- Heavy people
- Multi-floors: stairs
- Bad traffic
- Can’t predict
- Hard to locate

DISORIENTATION
- Lack of visible evacuation signs
- Unknown layout
- Can’t see
- Not knowing where other FF are

MISC
- Hoses easily tangled
- Get caught on corners

CARRYING BODIES

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<tr>
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<tbody>
<tr>
<td>Communication</td>
<td>Communication is fraught in a noisy environment. Sound is too widely accepted as the primary source of communication.</td>
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<td>Hardware difficulties</td>
<td>Radio must allow for radios to be activated with limited disability.</td>
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<td>Carrying Bodies</td>
<td>Bully gloves make it difficult to activate radios.</td>
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<tr>
<td>Conveying hazards</td>
<td>Communication requires a signal to move.</td>
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<tr>
<td>Conveying hazards</td>
<td>Being able to activate without the use of your fingers.</td>
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- Air tanks provide a firefighter’s back, and the shape is insurmountable. |
- Solution will allow a firefighter to carry up stairs without the air tank getting caught. |
- Design does not allow air tank to be caught on stairwells or any obstacles. |
- Lack of equipment requires firefighters to rely on multiple people and their strength alone. |
- Develop method for carrying fewer victims that only require two people. |
- Two people carrying heavier loads out of the building in the same amount of time. |
- Equipment failures

- No way of knowing cardinal directions. |
- Lack of equipment technology.

- Method will be able to direct a firefighter to any location within the building at any time. |
- Walk firefighter into a house with the aid of equipment and have them convey where they are relative to the building. |
- Improve visibility/detectability so that firefighters can locate civilians and other firefighters, obstacles, and tools. |
- Time required to find objects in a room that is filled with smoke and percentages of objects missed.
Example: Visual Idea Generation
Example: Low-Resolution Prototypes
What do past students say is UNIQUE about the Product Design Capstone?

• "It gives us a better understanding of how to solve real world problems"
• "Very user oriented"
• "It takes a very wholistic approach to design. We start from the beginning!"
• "Intense user research: YOU define the problems you are going to address"
• "The independence is awesome!"
• "You have an opportunity to choose a project that's interesting to you & your group”
• "You get to come up with your own project & explore your creativity"
What do past students say is the BEST thing about this capstone?

• "We get to do cooler stuff" - Conor Root (2022)
• "It's relatively self paced. We have room to ponder and explore."
• "The ability to drive direction and delegate responsibilities independently"
• "It challenges you to go out and figure things out for yourself"
• "You get to go very in depth with the product design process"
• "We get to solve almost any problem in almost any way we want. True freedom is really refreshing”
• “Prof Abell is always available for 1-on-1 help and team meetings”
What do past students say is CHALLENGING about this capstone?

• "Not jumping ahead to solve the problem before you define it"
• "There are almost no constraints initially, so it can be daunting to figure out what you need to do to solve a problem"
• "Trying to figure out the true root cause of a user's problem"
• "It touches on a lot of different skills, including drawing"
• "Being diligent about working & meeting with your teammates"
• "Keeping things on schedule- your own schedule"
• "You are responsible for your own fate. You must manage time to be successful"
This all sounds great! How do I proceed?

Enrollment is by permission of instructor, due to class size (<24)

Email Professor Abell directly to express interest & request permission to enroll
  • Please share why you want to join product design capstone
When will enrollment be confirmed?

Enrollment will be confirmed by April 1\textsuperscript{st}

*Is your course registration window before April 1\textsuperscript{st}??*

- Proactively enroll in your 2\textsuperscript{nd} choice capstone to hold your second-choice place
- Proactively enroll in the 5682.01 Product Design elective to hold your place
Questions?

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