University of California, Berkeley
Department of Mechanical Engineering

ME290KA: Innovation through Design Thinking (2 units)

Faculty:
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Teaching Assistant:
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Class Meetings:
M 1:00-4:00 pm; F 1:00-2:00 pm: Cal Design Lab (494 Wurster Hall)

Note: The lecture for the first class will be held on Friday, Aug 29 from 1-3PM. Please reserve 2 hours for this first class since the following Monday Sept 1 is a holiday. All subsequent Friday classes will be just one hour.

Office Hours:
Alan Van Pelt: After class and by appointment.
Jeremy Faludi: TBD

DURATION OF COURSE:
August 29-October 18. The final will be held on either Friday October 17 or Saturday October 18, depending on the preference of the class. Please hold both dates open until this has been finalized.

Course Description:
Designed for professionally-oriented graduate students, this course introduces students to Design Thinking; a human-centered approach to innovation and problem solving. Design thinking combines empathy for people and the context of a problem, creativity in the generation of insights and solutions, and rationality in analyzing and fitting various solutions to the problem context. Design firms such as IDEO and Jump Associates describe it as "matching people’s needs with what is technologically feasible and viable as a business strategy." The premise of teaching Design Thinking is that by knowing about how designers approach problems and the methods which they use to ideate, select and execute solutions, individuals and businesses will be better able to improve their own problem solving processes and take innovation to a higher level. Watch this 4 min video for a nice explanation of Design Thinking: http://vimeo.com/90355541.
This course emphasizes problem solving as a process within a people-centered context, employing methods from design, qualitative research, and prototyping, all in a collaborative, cross-functional environment. We will focus on collecting qualitative data, translating that data into unique insights, and insights into products, services, and experiences that improve people’s lives.

**Course Objectives:**
Design has become an increasingly powerful force in the last decade. What began as a focus on styling and aesthetics has led to sophisticated methods and processes for creatively tackling a wide variety of problems. More than ever, designers are called upon to place human needs at the center of their design engagement. As a result, Design Thinking has become a powerful approach to addressing issues at micro and macro levels, ranging from problem-solving complex social and cultural problems, to innovating in startups and Fortune 500 companies alike.

This course aims to teach students to be design thinkers who apply this problem solving and innovation process to a wide variety of problems. We will introduce students to the tools, practices, tenets, mindsets, and theory of Design Thinking, with an emphasis on practical application.

By the end of the semester, students will be able to:
- Explain the methods, processes, and key tenets of design thinking.
- Understand how a Design Thinking approach differs from other problem-solving approaches.
- Investigate problems, develop research methods, and synthesize results as a platform to create solutions.
- Develop a deeper and more holistic understanding of users and their needs, motivations, and behaviors.
- Develop unique insights about users, and focus those into design that has a clear perspective.
- Understand that, in addition to the creation of innovative objects and places, design thinking can be applied to the development of new processes, services, interactions, and collaborations.
- Recognize the interdisciplinary practice of various design professions and the value of design thinking as a means of innovative problem solving across disciplines.
- Build a rigorous and elegant argument for design projects.

**Course Prerequisites:**
Graduate level standing. It is recommended that this course be taken concurrently with or prior to ME290P (Managing the New Product Develop Process: Design
Theory and Methods) or ME290H (Green Product Development: Design for Sustainability), though it is not strictly necessary.

**Topics Covered:**
Design thinking models and tenets, qualitative research methods, problem finding and framing, analysis and synthesis of research, abductive thinking, ideation and creativity techniques, experimentation and rapid prototyping, concept testing, iterative design, and identifying and communicating unique points of view.

**Class/Laboratory Schedule:**
This class builds on Confucius's notion: "I hear and I forget. I see and I remember. I do and I understand." There will be a lot of doing in the class sessions to develop facility with the Design Thinking tools that students can apply to their own research projects and beyond.

- 4 hours of class per week for first half of Fall semester
- The three-hour sessions on Mondays will include lecture, discussion of readings, and some hands-on activities.
- The one-hour Friday session will expose students to designers from industry and provide some practical advice.

**Contribution of the Course to Meeting Professional Component:**
The course focuses on “soft” professional skills that are critical for successful innovation in industry today. Design thinking—which involves thinking things forward, thinking laterally, thinking systemically and thinking synthetically—transcends roles and disciplines. It is essential both for analyzing existing conditions and generating new opportunities. By exploring different ways of thinking and learning, and equipping practitioners with processes and toolsets, we will see that the education of a design thinker can be preparation for many possible futures.

**Assessment of Student Progress Toward Course Objectives:**
30% on homework assignments
30% on attendance and participation in class
30% on participation and deliverables in innovation tournament
10% on post-reflection and integration plan into a future design project

**Online Tools:**
We will make extensive use of the course bSpace web site to both communicate information to you and to converse with you about your homework and your class challenges. You will find the course listed on https://bcourses.berkeley.edu/courses/1251294.
Laptop, Tablet And Smartphone Policy:
Class time will focus almost entirely on in-class exercises to bring to life problem-based learning. You will need to give your full attention to your teammates, to the work you are being asked to do together, and to what you are taking away from that work. Please do not use your laptops or smart phones in class, unless it is for a class exercise or to take notes (no email, texting, web browsing, Facebook, etc.) Any violation of this policy will lead to a reduction in your participation grade. We love the way Adaptive Path, one of the design firms we work with, describes its policy along these lines:

*Honor the gathering.* In this ever more interrupt-driven digital world, it's a challenge to bring together all the right people at the same time to think, make and solve problems that are too complex for just a few people to figure out. Gatherings of this magnitude need opening ceremonies to acknowledge the value of the time we are about to spend together. Typically these ceremonies don't include marching bands or fireworks (although that would be cool), but there are small and simple actions that help us all recognize that this is a sacred time. These small things include sending out invitations ahead of time, providing food and drink, creating an environment where people can focus without laptops or smart phones, welcoming and orienting people to our day together, and having the client sponsor begin the workshop with essentially an opening blessing for the people gathered and the work we will accomplish. ([www.adaptivepath.com](http://www.adaptivepath.com))

Textbook (s) and/or Other Required Readings:

Other assigned readings are linked in the syllabus below. All readings should be finished before class, as your grade is partially based on your participation in class discussions about readings.

Homework Assignments:
For each class session there will be individual and group assignment that students must complete before coming to class. These assignments allow students to experiment with some of the techniques being taught in the class and will be the basis for in-class exercises.

Class Attendance and Participation:
There are only seven weeks of class for this course, plus an innovation tournament. All of these sessions will entail active exercises with others in the class. Your participation grade will be based on your *on-time arrival to and participation in class sessions.*
Course Design Challenge:
In order to allow this course to scale to a large number of students, there is no term-long project. Rather the course is designed to complement other design courses, but adds depth with complementary Design Thinking skills.

Students will be encouraged to bring to class their own MS/PhD projects, problems they want to see better solutions for, or other design concepts that they want to push forward using Design Thinking tools. You might even want to choose something that has commercial potential – i.e., a business you’d be excited about starting. Students will propose their ideas and teams will be formed around those ideas.

Class 1 (Friday 8-29 1-3pm, Friday 9-5 1-2pm): Introduction to Design Thinking
Design Thinking is an iterative process of Understanding, Ideation, and Realization. Using a human-centered approach, Understanding comes from empathy building techniques. Ideation is the process of generating and refining ideas based on that understanding. Realization is the process of making those ideas real enough that they can be interacted with to further understanding. You will be introduced to different models of Design Thinking, but we will use the one pictured here to organize class material.

In the first week, we’ll introduce you to the Design Thinking process, talk about its relevance and importance, and engage in class exercises to try the entire process.

Readings (complete before class):
• “Asking the important questions: A guide to design thinking.”
  http://www.innovationmanagement.se/2011/05/30/asking-the-important-questions-a-guide-to-design-thinking-and-a-better-way-to-serve-customers/
Week 2 (Monday 9-8): Building empathy through qualitative research
At the heart of Design Thinking is the ability to build empathy for users, to see situations from multiple perspectives, and to see with a “beginner’s eye.” Deep understanding of your users leads to new perspectives which, in turn, spawn novel solutions. This involves collecting both quantitative and qualitative data, and being open to questioning assumptions and trying on others’ points of view. For many reasons, people often have trouble directly articulating what they need and want. (Henry Ford: “If I had asked people what they wanted, they would have said faster horses.”) Your job is to watch people closely and elicit stories from them that give us clues about their unarticulated beliefs and needs.

This class session will focus on how to build deep empathy for users, including what to watch for, how to ask good questions and elicit stories from people, how to get to the heart of motivations, and why we need to question our initial assumptions and interpretations.

Readings (complete before class):
- Getting People to Talk: An Ethnography & Interviewing Primer, http://vimeo.com/1269848
- Interviewing Users by Steve Portigal.
  - Skim Chapters 1 & 2
  - Chapters 5 & 6
- Read the Note on Observation on bCourse.

Optional Reading
Week 3 (Monday 9-15): Interpretation - Analysis of research
One of the most challenging parts of the Design Thinking process is making sense of the research data and developing insights. Dev Patnaik of Jump Associates calls it “cutting cubes out of fog.” This data can be hard data – statistics you’ve collected about your product, issue or situation, and it can be soft data – videotapes of the interviews you did with your customers, quotes from users and the like. Inevitably, when you start this part of the process, the pile of data looks overwhelming and it is hard to believe you will be able to learn anything meaningful from it. It may also appear to be nothing new, or overly subjective and anecdotal. We’ll focus on analysis techniques to help dissect stories you hear, find patterns, and draw out needs and unique insights that can be abstracted to a larger group. In this phase, you’ll seek to understand more deeply why people are doing and saying what they are, and describe that understanding with simple diagrams, models, and frameworks.

Readings (complete before class):
• Observing the User Experience by . Ch 15: Analyzing Qualitative Data. Look on BCourse.

Optional
• Interviewing Users by Steve Portigal. Ch 9, p136-141 (up until Research as a Leadership activity section).
• Digging beyond user preferences. Indi Young Google tech talk. Skip minutes 14:00–25:45. Take notes. https://www.youtube.com/watch?v=M4AsxNg9nNU

Week 4 (Monday 9-22):
Directions - Finding a Unique and clear POV
While analysis techniques help clarify and organize your research, synthesis techniques help you come to a point of view. Your point of view is your unique design vision,
derived from discoveries made in your empathy building. It's a guiding statement that focuses on specific users and insights. In this class, we'll focus on tools and methods that help to develop focus and a unique point of view. We'll learn to think about whitespaces and to create design principles.

Readings (complete before class):
- Developing a Unique POV. Stanford Institute of Design. [http://www.stanford.edu/class/me228/pdf/cia_pov_overview.pdf](http://www.stanford.edu/class/me228/pdf/cia_pov_overview.pdf)
- Excerpt from Needfinding by Dev Patnaik. Design Principles. On Bcourses

Optional

Week 5 (Monday 9-29): Solutions - Ideate, Prototype, Testing, Selection
The secret to good ideation is that the good ideas come from provocative prompts and questions. These prompts are often most successful when they come from specific and meaningful insights about your users and your challenge. When you mix user insights with other kinds of prompts and force yourself to make connections, great ideas happen.

In the first three weeks, you will hear multiple times about the dynamic balance between diverging and converging. This session will focus on really diverging – or in other words generating a LARGE volume and WIDE range of ideas for your design challenge.

Prototyping is getting ideas and discussions out of your head and into the physical world. Prototypes force you to stop discussing and start creating. Your goal is to build to think and learn. Prototypes foster clarity and help engage your users in a different way, to further your understanding. A prototype need not be very polished, but should push you learning forward. A prototype could be as simple as a
Storyboard, or as complex as a 3D printed object. The idea is that the fidelity should be commensurate with your progress and what you want to learn about.

Getting feedback from others is an important part of the design process. Early on, your prototypes and ideas will be crude, so the type of feedback you solicit will be different than when your prototypes and ideas become more refined. We'll discuss different approaches to collecting feedback and how to address that feedback.

Readings (complete before class):

**Week 6 (Monday 10-6): Storytelling and Effective Presentations**

Throughout the class so far, stories have played an important role. We've talked about gathering stories from users or customers so that we can better understand their needs, and have shared the insights gained from observation and interviews in stories. We've used metaphors to generate ideas and frame compelling stories around those ideas, and created short stories to motivate adoption of new offerings. Broadly speaking, the Design Thinking process can be thought of one of “figuring out the story” and then “telling a new story.” In this session, we focus on storytelling for its importance in engaging others in the ideas we generate through the design process. You’ll learn about how to use story-telling techniques to inspire others to embrace your ideas.

Readings (complete before class):
- Read: Peter Guber Interview – The MAGIC is Story at [http://tinyurl.com/3phk6bl](http://tinyurl.com/3phk6bl).
• “How to present like Steve Jobs.” http://blog.kissmetrics.com/present-like-steve-jobs/
• “How to design and deliver presentations like a pro.” Garr Reynolds. http://www.garrreynolds.com/Presentation/pdf/presentation_tips.pdf
• Watch TEDX: Nancy Duarte: The secret structure of great talks, http://youtu.be/1nYFpuc2Umk
• Read the following blog posts by Nancy Duarte:
  http://blogs.hbr.org/cs/2012/10/how_to_present_to_senior_execu.html
  http://blogs.hbr.org/cs/2012/10/create_presentations_an_audien.html
  http://blogs.hbr.org/cs/2012/10/do_your_slides_pass_the_glance_test.html
  http://blogs.hbr.org/cs/2012/10/structure_your_presentation_li.html
  http://blogs.hbr.org/cs/2012/11/disarm_your_audience_when_you.html
  http://blogs.hbr.org/cs/2012/12/avoid_these_five_mistakes_in_y.html
  http://blogs.hbr.org/cs/2013/03/when_presenting_your_data_get.html

**Week 7 (Monday 10-13): Design Challenge Presentations & Tournament**
You'll present your design challenge work to the class.

The remaining class time will be used to introduce the final exam. The final exam will take the form of an innovation tournament, with a sponsor that has an innovation challenge. You will have an opportunity to follow the entire Design Thinking process during this tournament week.

You will be given the general challenge during an orientation session with the sponsor, who will be available to share their thinking about the challenge, provide background on the company and its capabilities, describe the criteria they will have for judging concepts and answer any questions you may have.

We expect that you will compete in small teams. You will have time in class to plan your attack on the problem, how you will conduct your interviews, how you will share the insights you've gained, and anything else you want to do to prepare yourselves for the tournament. You will have the opportunity to solicit feedback from instructors and TAs during the week.

**Final Exam and Reflection: Innovation Tournament (10-17 or 10-18):**
On the last day of the tournament, you'll have the opportunity to get feedback from the sponsor, and iterate through the process. In the last hour, you'll present your solutions and the sponsor will choose a winner.

**Final Tournament Team Deliverables:** After the tournament, you are to create a one-page summary of your final idea(s) that includes rationale for the idea(s).

**Individual Deliverable:** We will ask you to write a short, one-page reflection on what you learned from the class and how the concepts and techniques from Design Thinking could be used in other classes, research, or projects.