TE 230: Design Thinking/Need Finding

Technology Entrepreneur Center
GRAINGER ENGINEERING

Fall 2022

- **3 credit hours**
- **Tuesday/Thursday**
- **2:00-3:20pm**
- **1002 Siebel Center for Design**
- **Crosslisted with ARTD 230**

Instructor

Prof. David Weightman
diw@illinois.edu
128 SA+D

Office Hours

Access to me will be during class times and by appointment outside those times, within the normal 9-5 work week. I am best contacted by email using ARTD 230/TEC 230 in the subject line. I am fairly good at responding to email but not great with text messages.

Course Purpose

The aim of this course is to introduce you to human centered design practice (HCD), as a basis for problem finding and opportunity identification, an invaluable pre-cursor to good innovation development. It is focused on determining people's needs and collaborating with them in developing design solutions which address those needs. This course is operated in a rather different format from most of the courses you have experienced at UIUC, and we hope it will be a valuable and transformative experience for you. It remains an experimental learning experience and one which requires your active participation, as well as your continued reflection on your progress. Successful participation will require getting involved with the fuzzy front end of design development, where design requirements are often ill defined or ambiguous, where problems can be wicked and design solutions hard to test in familiar quantitative ways. We aim to give you some tools and strategies to navigate this zone of ambiguity.

Learning Objectives

Upon completion of this course, you will have:

1. developed familiarity with the process of determining user needs and identifying design opportunities,
2. developed collaborative design skills by working with people in the development of design solutions which address their needs,
3. gained experience of a number of research, ideation, prototyping and team-working strategies for collaboration within your project teams,
4. developed communication skills in presenting research findings and design proposals to others, and
5. developed your ability to reflect individually on the processes involved in these design activities.

Required Reading

- **Innovating for People: Handbook of Human-Centered Design Methods; *Luma Institute*** – available on Amazon as a spiral bound book or a Kindle download. Currently Amazon has a free two month free read access which I would encourage you all to sign up for.

- Other texts and videos will be suggested as we go along and you are encouraged to access these via the Library, Mediaspace, Box, or Canvas.
- Other useful reading is listed later in this syllabus.

How This Course Works

This course will be delivered in regular in-person mode. It will be delivered in the new Seibel Center for Design as one of the first classes to be located there. The building is finished but there may be some glitches as we get things going! We will be using a classroom space in SCD, and you should also have access to the workshops there. One thing you will notice is that power for laptops etc. is a little scarce so making sure you are charged up before the class or buying a backup battery will be essential.

Group work forms a big part of the course with groups of 4 being optimum. The current state of COVID protocols in the University is that masks must be worn in SCD at all times and a degree of social distancing may be applied. Occasionally some of you will engage with the class on line via Zoom, usually because you are quarantining.

Design thinking is a term with origins in industrial design practice, rather than the more quantitative realm of engineering design and design science. It describes a human-centered approach to design and innovation in products and services, addressing the quadri-partite requirements of feasibility, desirability, responsibility, and viability. This involves considering all aspects of the relationship between people and the products, services and experiences they will make use of, including functional, visual, tactile, social, contextual, and emotional aspects. It involves using a variety of thinking processes - with an emphasis on the use of observation, empathy, ideation, and modeling to discover and address opportunities for design propositions, along with the communication of design outcomes by diagrammatic and narrative means. Design thinking also has many applications in the social realm, impacting many areas of human activity. This kind of design activity is best done in teams, hence the project team basis for this course.

Thinkers about design, such as Jane Fulton Suri of IDEO, have characterized the historical development of human-centered design practice as starting with "**design for** (people), proceeding to **design with** (people), and aiming towards **design by** (people)." Our activities on this course fall in the middle of that spectrum, emphasizing designers collaborating with people to better answer those people's needs.

The course will be centered on design projects carried out in teams comprising no more than four people from different disciplines. Much of the course time will be involved with the actual project work but there will be a series of support lectures covering the nature of innovation; discovering user needs and the use of empathic research methods; ideation, conceptualization, and prototyping; communication strategies; teamwork and team building; the nature of multi-disciplinary teams. In the time that we have the outcome will be design concepts and proposals, rather than fully resolved designs.

The emphasis of the course is on problem-finding, as problem framing is an essential part of the design process, but we will be giving you opportunities to exercise your undoubted problem-solving skills in the later stages of the semester.

The course will use two 80-minute time slots per week with usually a mixture of group session / lectures on one day and project worktime on the other. Meetings with users will be an important part of the research process but in the current situation are likely to be virtual. These will need to take place at various times throughout the week, not always in the class time, so you will need to make particular arrangements for these. This may be a looser pattern of activity than some of you are accustomed to but I am sure you will adjust quickly. COVID-19 poses particular challenges in the conduct of user research, but I am sure you will cope with that.

Assessment/Submission Requirements

There will be two assessment events, with grading to reflect the degree to which you have attained the learning outcomes identified above.

1 Production of an Individual Reflexive Design Journal / 30%

This journal is intended to develop your ability to reflect on your experiences on the course. You should aim to produce one page per week as an account of your work within the projects and in your team. You should use it also as a scrapbook to record inspirations and relevant research activities. Each week you should aim for an entry which describes three design opportunities or interesting design examples. Each case should be an image and a paragraph of text. The journal is intended to be honest and will be confidential to the faculty unless you wish to share it more widely. Photos and links to websites, articles, books etc. are most welcome. The journal will be submitted as a PDF file to the course Box folder. Expression and inventiveness in presentation are positively encouraged. The journal should relate to each of the four phases of the course. In addition, there will be a short open-ended answer quiz for each video that I ask you to view outside the class time. Extra credit will be given for examples which are particularly interesting, rather than everyday objects that surround you.

The journals should be submitted by Sunday evening of the week concerned and will be reviewed at the end of week 5, and at the end of the semester. Feedback at week 5 will enable you to re-work those journals before the end of the semester.

2 Collaborative Design Project / 70%

In teams of four, composition to be determined at the start of the semester, you are to research a user group, define design opportunities for an identified need of that group and work collaboratively with them to produce design proposals. The results of your investigations will be presented to the class in presentations in at least three sessions during the semester. Inventiveness in presentation is encouraged but content is paramount. All team members will receive the same assessment, so it is in everyone's interest to collaborate. Instances of irreconcilable breakdown of relationships will be dealt with on a case-by-case basis. You will be able to comment confidentially on the performance of others in the team in your journals. Final presentations will be in the form of a PowerPoint presentation and a 20-page report from the group (this should not be simple reprints of the PPT slides).

Assessment

Evaluation of projects will be against the course outcomes outlined above. Assessment for each of the presentations will be posted on Compass as letter grades.

- A- is the anticipated mean grade for the course and represents the demonstration of competence in research, ideation, and idea development with some areas for improvement.
- A represents better than mean competence in aspects of the design process.
- A+ represents demonstration of excellence in all areas of the design process.
- B+ represents a less than competent demonstration where some areas have been omitted or not effectively addressed.

B and below indicates major deficiencies in the demonstration of skills or major omissions in the material presented.

F = unsatisfactory or non-completion of course or component.

For group projects, all members get the same grade unless there is solid evidence of non-participation (this is rare but occasionally happens). Almost never does one member's grade get increased because they have done all the work (they say).

Grades for components are averaged out, weighted by the component percentages.

The following rubric is a general one for Design Studio projects, so bear in mind that this course has limited expectations at Stage 5 and later. This will be made clearer as we adjust to the working situation in the building.

Assessment Rubric	Excellence A+	Competence A	Developing Competence A-	Adequate B+
Stage 1 Inquiry	Comprehensive survey of existing market Good mix of primary and secondary data sources Significant number of direct user contacts	Good survey of existing market Good secondary data, some primary data found Solid attempt to generate user data	Incomplete and narrow study of existing market with limited primary data or user research Mainly secondary data used	Minimal study of existing market with little primary data and/or only limited secondary sources used
Stage 2 Insights	Insightful analysis of data and feedback Summarized clearly as a basis for action	Solid analysis of inquiry data Some useful insights as a basis for future action	Limited or incomplete analysis of inquiry data with few insights as a basis for action	Minimal insights with little impact on future actions
Stage 3 Ideation	Wide range of innovative ideas that directly address insights Well communicated via sketches and models High level of creativity and originality	Good range of concept ideas that address insights Some evidence of creative and innovative approach Ideas well communicated in sketches or soft prototypes	Limited number of design concepts, with few illustrations, not well executed Limited evidence of innovation or creativity	Very small number of concept designs with little or no innovation or creativity
Stage 4 Involvement	Productive collaboration with users and primary research sources Solid evidence of collaboration in the design process Effective collaboration with team members in different roles	Some contact with users and primary data sources Some evidence of collaboration and co-design	Limited or no collaboration with small number of users, with little evidence of impact on the design process	No collaboration with potential users
Stage 5 Implementation	Excellent development of concepts into realistic designs, fully and credible detailed for construction and manufacture, illustrated in sketches, renderings, drawings and models	Good development of concepts into realistic design proposals, some level of detail of construction and manufacture, embodied in sketches, renderings, drawings, and models	Small number of design proposals addressing insights. Low quality of execution, evidenced in sketches, renderings, and models Limited details of manufacture and construction Proposals not innovative or original	Only very small number of design proposals with minimal or no details of execution Little innovation displayed
Stage 6 Informing	Design proposals communicated well in drawings, sketches, models, and prototypes Effective PowerPoint presentation to clearly describe design process and outcome Effective use of video to communicate ideas, process, and outcomes (if used)	Design proposals communicated adequately in drawings, sketches, and models Demonstrated ability to use PowerPoint and video to communicate ideas, process, and proposals	Designs proposals not comprehensively presented in sketches, renderings, or models PowerPoint limited, with little explanation or exposition Little or no use of video to communicate	Rudimentary presentation of ideas and design proposals or with significant omissions No video presentation
Self-evaluation	Excellent reflection and assessment of own role, either alone or within group	Solid reflection and analysis of role, alone or within group	Some attempt at reflection and/or analysis of role	Minimal or zero attempt at reflection and/or analysis of role
Participation	Active participation in projects, assignments, attendance/discussions, and critiques	Some participation	Little participation	No signs of collaboration

Submission Requirements

You will be invited to the class Box folder for submitting presentations in advance of events. When you do this, please use the following protocol for subject lines:

ARTD 230 / TEC 230 / title of presentation / presentation event / your name(s) / date

Also, if you are sending me emails, please use the course number in the subject line so that I can find them!

Location of Sessions for On-Campus Delivery

Room 1002, SCD Access will be subject to the University COVID-19 protocols. Each group will have access to a locker in the building to store stuff in between classes.

Course Material

If recorded via Zoom, lecture PPTs from the course should be available in a Box folder that you will be invited to, and to which you will post your presentations and journals. There will also be a Canvas site for course information and grades.

Outline of the Course

The course is organized in phases and the outline shows critical dates and the times of lectures and briefings, In the first two weeks we will establish the composition of the teams. We will try and get our teams to be broadly composed with a mixture of disciplines. If there are other students you do not feel comfortable working with, just need to cite “personal reasons” and we will work around that.

i6 An Illinois Approach to Design Thinking

Phase 1 – Inquiry

To quote from “Innovating for people”

> “Innovation begins and ends with people. It calls for keen and caring observation. The disciplined practice of Human-centered design involves careful investigation. It requires curiosity, objectivity and empathy. You need to engage all of your senses (looking, listening and so forth) in pursuit of meaningful findings.”

Observation is critical to establishing user needs and is also the first part of building a relationship with users which will be essential in the later stages of the semester. The text broadly describes three methods of inquiry – Ethnographic research, Participatory research, and Evaluative research. We will engage in at least three of the methods within these topics and compare results.

Phase 2 – Insight

> “Innovation is not a light bulb moment of genius, It calls for deep understanding and rigorous discernment…..The disciplined practice of HCD involves thoughtful analysis. It requires critical thinking and problem framing. You need to identify patterns, determine priorities and translate your research into actionable insights.” – Innovating for people

So, this phase is about generating the insights which will inform the design phase which follows, using the approaches of people and systems, patterns and priorities and problem framing. This will also

involve considering the needs of stakeholders in the process so whilst some of these approaches can be done by the team on its own, others will involve working closely with your user group.

Phase 3 – Ideation

And now the part you have been waiting for…you get to design some things which address the needs you have identified.

> "Innovation puts great ideas into action. It calls for making things happen in a resourceful and resonant manner. The disciplined practice of HCD involves imaginative, visual expression. It requires a commitment to successive improvement through frequent iteration. You need to think with your hands to bring new ideas to life." – Innovating for people

Bringing ideas to life means prototyping on a whole variety of levels. We will concentrate on quick and dirty prototypes where returns are faster and the process more immediate, using sketches and sketch models to do this.

Phase 4 – Involvement

This stage involves working with users in a co-design activity as together you develop, articulate and test your ideas. You should be going back to your users with demonstrations of your ideas for their critical feedback. A particularly important feature of this stage is presentation and communication to them as well as the rest of the class. Establishing a narrative or story for your work is a very effective approach at this stage and we will introduce you to a number of ways of doing this.

Phases 5 and 6 of the Design Thinking methodology are **Implementation** and **Informing** but we do not anticipate completing those stages in this course. **Informing** will be a constant feature of our work at various stages however, with a variety of different presentations.

Tentative Schedule of Sessions

As we progress, the content of some of these dates may shift.

Session	Date	Topic
1	August 23	• Introduction to the course LEC
2	August 25	• Introduction continued
3	August 30	• Ideating possible user groups / LEC
4	September 1	• Agreeing your team composition and user group
5	September 6	• Inquiry phase begins / Strategies for determining user needs / Project work session / LEC
6	September 8	• Empathy and ethnography / Project work session
7	September 13	• Project work session / LEC
8	September 15	• Progress report on inquiry activities
9	September 20	• Project work session
10	September 22	• Project work session / Review of journal progress
11	September 27	• Presentation of results of Inquiry phase / Insight phase starts / LEC
12	September 29	• Methods for analysis
13	October 4	• Working in multi-disciplinary teams
14	October 6	• Project work session
15	October 11	• Presentation of results from Insight phase (20% of grade) / Ideation phase starts / LEC
16	October 13	• Ideation / Intro to Brainstorming
17	October 18	• Project work session
18	October 20	• Modeling and prototyping
19	October 25	• Six concept presentation / LEC
20	October 27	• Involvement phase starts

21	**November 1**	• Project work session
22	**November 3**	• Initial concept design presentations / (20% of grade)
23	**November 8**	• Election day
24	**November 10**	• Implementation phase starts / Project work session
25	**November 15**	• Project work session
26	**November 17**	• Design progress presentations
Thanksgiving Break		
27	**November 29**	• Project work session
28	**December 1**	• Project work session
29	**December 6**	• Final presentation of projects (30% of grade) / LEC
	December 17	• Submission of Journals (20% of grade)

Books

Innovating for People, A Handbook of Human-centered Design Methods / Luma Institute
A sound and eminently practical guide to methods of eliciting and evaluating user needs and desires with lots of very useful approaches. Highly recommended. Out of print often but available electronically on Amazon. Also available as a Kindle download on Amazon…just join up for the free two-month trial.

Useful Additional Reading

Research methods for Product design / Alex Milton and Paul Rodgers
This is from the series Laurence King Portfolio skills for product design...all are excellent and aimed at students with a wealth of helpful information about tools and techniques which de-mystify and enhance the product design process.

100 Things Every Designer Needs to Know About People / Susan M. Weinschenk
How behavioral psychology offers insights in the complex relationship between people and the world, with particular application to the world of websites and UX, but with wider relevance as well.

Creative confidence / Tom Kelley
A good account about how creativity is a muscle we all possess that can be nurtured.

PresentationZen Design / Garr Reynolds **
Everybody who uses PowerPoint or does presentations of any kind should read this. Lots of solid design advice for people who don't have the benefit of a graphic design degree. Enough connection with Zen philosophy to make it interesting for people inclined that way (like me).

Hidden in Plain Sight / Jan Chipchase with Simon Steinhardt, HarperCollins, 2013
"Jan Chipchase is one of the world's experts on emerging markets; his regular reports from the field are a fascinating way to stay aware of the bubble many of us live in while we try to design for the whole world. His blog is also great to follow."

A Field Guide to Human Centered Design / IDEO
A great practical guide, available as a free download from the IDEO website, concentrates on social applications of HCD and design thinking.

About the Instructor

David Weightman is a Professor of Industrial Design at the School of Art and Design. After obtaining his Master's degree in Industrial design (Engineering) from the Royal College of Art in London, he worked at the Indian Institute of Technology in Delhi, India, then taught on the Industrial Design Transport program at Coventry University. Latterly, he was the Dean of the School of Art and Design at Staffordshire University and a consultant to Yamaha, Massey Ferguson, British Rail, BBC television and the Tate Gallery London. Now in the U.S., his teaching and research involves exploring the new relationship between product users and the design/ manufacturing process with a focus on the effect of new technology. He was a member of the National Association of Schools of Art and Design working group on the future of design education and recently served as Midwest District Vice President of the Industrial design Society of America. He has recently completed a Residency as an IDEA Studio Scholar at Autodesk LLC in San Francisco.

Additional Information

This will be the same for all your courses, so please read and remember!

Support Resources and Supporting Fellow Students in Distress

As members of the Illinois community, we each have a responsibility to express care and concern for one another. If you come across a classmate whose behavior concerns you, whether in regards to their well-being or yours, we encourage you to refer this behavior to the Student Assistance Center (1-217-333-0050) or online at odos.illinois.edu/community-of-care/referral/. Based upon your report, staff in the Student Assistance Center reaches out to students to make sure they have the support they need to be healthy and safe.

Further, as a Community of Care, we want to support you in your overall wellness. We know that students sometimes face challenges that can impact academic performance (examples include mental health concerns, food insecurity, homelessness, personal emergencies). Should you find that you are managing such a challenge and that it is interfering with your coursework, you are encouraged to contact the Student Assistance Center (SAC) in the Office of the Dean of Students for support and referrals to campus and/or community resources. The SAC has a Dean on Duty available to see students who walk in, call, or email the office during business hours. For mental health emergencies, you can call 911 or contact the Counseling Center.

Netiquette Statement (Courtesy of CITL)

In any social interaction, certain rules of etiquette are expected and contribute to more enjoyable and productive communication. The following are tips for interacting online via e-mail or discussion board messages, adapted from guidelines originally compiled by Chuq Von Rospach and Gene Spafford (1995):

- Remember that the person receiving your message is someone like you, deserving and appreciating courtesy and respect
- Avoid typing whole sentences or phrases in Caps Lock
- Be brief; succinct, thoughtful messages have the greatest effect
- Your messages reflect on you personally; take time to make sure that you are proud of their form and content
- Use descriptive subject headings in your e-mails
- Think about your audience and the relevance of your messages
- Be careful when you use humor and sarcasm; absent the voice inflections and body language that aid face-to- face communication, Internet messages are easy to misinterpret
- When making follow-up comments, summarize the parts of the message to which you are responding

COVID

Following University policy, all students are required to engage in appropriate behavior to protect the health and safety of the community. Students are also required to follow the campus COVID-19 protocols.

Students who feel ill must not come to class. In addition, students who test positive for COVID 19 or have had an exposure that requires testing and/or quarantine must not attend class. The University will provide information to the instructor, in a manner that complies with privacy laws, about students in these latter categories. These students are judged to have excused absences for the class period and should contact the instructor via email about making up the work.

Students who fail to abide by these rules will first be asked to comply; if they refuse, they will be required to leave the classroom immediately. If a student is asked to leave the classroom, the non- compliant student will be judged to have an unexcused absence and reported to the Office for Student Conflict Resolution for disciplinary action. Accumulation of non-compliance complaints against a student may result in dismissal from the University.

Emergency Response Recommendations

Emergency response recommendations can be found at the following website: http://police.illinois.edu/emergency-preparedness/. I encourage you to review this website and the campus building floor plans website within the first 10 days of class. http://police.illinois.edu/emergency-preparedness/building-emergency-action-plans/.

Sexual Misconduct Reporting Obligation

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX Office. In turn, an individual with the Title IX Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: wecare.illinois.edu/resources/students/#confidential. Other information about resources and reporting is available here: wecare.illinois.edu.

Academic Integrity

You are expected uphold the highest ethical standards, to be honest, and to practice academic integrity. **This includes doing original work and citing sources**, including the work of other students. Please give special care to prepare high-quality submissions with proper grammar and spelling.
The University of Illinois at Urbana-Champaign Student Code should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: http://studentcode.illinois.edu/. Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: https://studentcode.illinois.edu/article1/part4/1-401/. Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

Religious Observances

Illinois law requires the University to reasonably accommodate its students' religious beliefs, observances, and practices in regard to admissions, class attendance, and the scheduling of examinations and work requirements. You should examine this syllabus at the beginning of the semester for potential conflicts between course deadlines and any of your religious observances. If a conflict exists, you should notify your instructor of the conflict and follow the procedure at https://odos.illinois.edu/community-of-care/resources/students/religious-observances/ to request appropriate accommodations. This should be done in the first two weeks of classes.

Disability-Related Accommodations

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 333-4603, email disability@illinois.edu or go to https://www.disability.illinois.edu. If you are concerned you have a disability-related condition that is impacting your academic progress, there are academic screening appointments available that can help diagnosis a previously undiagnosed disability. You may access these by visiting the DRES website and selecting “Request an Academic Screening” at the bottom of the page.

Family Educational Rights and Privacy Act (FERPA)

Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See https://registrar.illinois.edu/academic-records/ferpa/ for more information on FERPA.

Anti-Racism and Inclusivity Statement

The Grainger College of Engineering is committed to the creation of an anti-racist, inclusive community that welcomes diversity along a number of dimensions, including, but not limited to, race, ethnicity and national origins, gender and gender identity, sexuality, disability status, class, age, or religious beliefs. The College recognizes that we are learning together in the midst of the Black Lives Matter movement, that Black, Hispanic, and Indigenous voices and contributions have largely either been excluded from, or not recognized in, science and engineering, and that both overt racism and micro-aggressions threaten the well-being of our students and our university community.

The effectiveness of this course is dependent upon each of us to create a safe and encouraging learning environment that allows for the open exchange of ideas while also ensuring equitable opportunities and respect for all of us. Everyone is expected to help establish and maintain an environment where students, staff, and faculty can contribute without fear of personal ridicule, or intolerant or offensive language. If you witness or experience racism, discrimination, micro-aggressions, or other offensive behavior, you are encouraged to bring this to the attention of the course director if you feel comfortable. You can also report these behaviors to the Bias Assessment and Response Team (BART) (https://bart.illinois.edu/). Based on your report, BART members will follow up and reach out to students to make sure they have the support they need to be healthy and safe. If the reported behavior also violates university policy, staff in the Office for Student Conflict Resolution may respond as well and will take appropriate action.