

Senior Design Project - MECH 4366 006

CRN: 19335

Duration: Aug 24, 2020 - Dec 03, 2020

Wednesdays from 3-5:50 pm **on ZOOM**

<https://us02web.zoom.us/j/83103442150?pwd=VHczRks4MHZiNzdkQXpZT2NJK3BEQT09>

Meeting ID: 831 0344 2150

Passcode: 947641

Course Instructors:

Dr. Chris Danek, Slack DM or 650-269-9514 (chris@bessel.co or cjdanek@utep.edu)

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Prerequisites

Interest or passion to discover how to use Human Centered Design to develop a solution to a pressing problem, by working on a project in a team.

Goals

In this course, students will:

- Practice tools for developing successful purpose-driven products or companies, aimed to be sustainable and scalable, using three pillars
 - Design Thinking: Human-Centered Design and Customer Development
 - Agile development: Scrum / Agile project management
 - Ethics-Guided Design
- Exercise and build technical proficiency and 'soft skills' including
 - Leadership
 - Teamwork in multidisciplinary environments
 - Communication
 - Collaboration
 - Critical Thinking: Analysis, Modeling, Interpreting
 - Designing and applying experiments to support development
 - Iterative Design and Development
- Develop a strong understanding of value creation

Our Values and Culture

- Culture of Caring and Respect

- We care for and respect the students, teaching team, and community
- We actively listen to stakeholders and strive for empathy
- We improve our results through inclusiveness and diversity
- Culture of Discipline
 - We make weekly progress
 - We honor our commitments
 - We pursue excellence in documentation
- Culture of Achievement
 - We learn and grow through our project work
 - Our projects will create value in society
 - We aim for successful project delivery

Course Format & Agile Method

The course is organized around hands-on projects, which teams will work through much as a team would do inside a company or startup. The Agile method is emphasized.

- (1) Iterative Development with weekly, measurable progress organized into 3 Agile Sprints
 - (a) Teams will routinely “get out of the building” to test ideas and assumptions with stakeholders / customers.
 - (b) Teams will perform technical development (prototyping, testing, engineering analysis and simulation, research).
- (2) Prior to class meetings, There will be assigned readings and/or brief videos to watch that introduce course topics.
- (3) Class meetings will typically include a brief discussion of the pre-assigned prep, followed by workshops or guest speakers. Most of the course meeting time will consist of team presentation of progress and feedback from peers and the teaching team.
- (4) Support:
 - (a) Dr. Danek will post office hours (TBD)
 - (b) Teams will have support from the teaching team from this course and from the School of Engineering faculty as “Subject Matter Expert” Advisors.

Course Calendar and Timing of Agile Sprints

Teams will iterate (design-build-test) a complete prototype during each of 3 Sprints. Each Sprint is kicked off with an in-class workshop for Sprint Planning. At the end of each Sprint are team “Sprint Demos” which are detailed presentations of the technical development, business model development, and Ethics Guided Design activities accomplished.

Sprint	Week	Pre-work	Workshop / In Class Topic	Team Presentation Focus
1	Sprint 1 Theme: Customer Discovery & Prototyping to Learn Human Centered Design			
	1 8/26	None	Course Introduction Project selection Leadership and teamwork Vision and Mission	NA
	2 9/2	1. Preliminary research > lit review prob & tools 2. Talk to 3 SMEs. 3. Watch: Udacity Lesson 3, Business Models 4. Prepare to present your assigned Design Thinking Mindsets: timebox 20 min ok	Reaching out - in writing. Timebox. HCD: Conversation props (prototypes) Agile Engineering: User Needs / Requirements / Solution table Risk Management	Standard Presentation + Design Thinking Mindsets Concept Development
	3 9/9	1. Lit review: prob & solutions 2. Talk to 6 SMEs 3. Frame your Design Challenge pp 31-33 Field Guide to HCD 4. Watch https://www.youtube.com/watch?v=7P6mR8McWc&list=PLC6YVI-cQtleKERoaX2dl2DcZgP8hydQx&index=17&t=0s through minute 26:45	Reaching out - in writing. Timebox. Scrum HCD: Developing empathy - journey map, shadow, interview Agile Engineering: Git Workflow version control in Onshape	Framed Design Challenge Prototype with simulation

		5. Run a simple simulation relevant to your project		
	4 9/16	1. Lit review: off the shelf solutions 2. Talk to 2 SMEs	HCD: Converge: filter, synthesize, "how might we" Agile Engineering: Technology Strategy > Project Planning <i>Phoenix Atherectomy case study</i>	Iterated concept; Ideal Solution & User Needs / Potential Solution Table; Iterated learning prototypes
	5 9/23	Prepare Sprint Review Pres.	Sprint 2 Planning	Sprint 1 Review Design concept, prototype & testing
2	Sprint 2 Theme: Prototype and Test / Simulate Scrum / Agile Project Delivery			
	6 9/30		Scrum: Artifacts, Roles & Events Props & Prototyping to Learn	Learning Prototype(s)
	7 10/7	Accomplish your goals for the week!	Scrum Boards Team Velocity & Teamwork reflection	Crisp 6 minute delivery including technical details
	8 10/14	Video TBA	Team Velocity & Acceleration.	Team velocity D-B-T & Teamwork reflection verbal shareout. Dr. Danek will ask guiding questions during class
	9 10/21		Risk Management	
	10 10/28		Ethics & Codes of Ethics	
	11 11/4		<i>Ethics, Mission Statement</i>	Sprint 2 Review
3	Sprint 3 Theme: Iteration and Refinement Ethics Guided Design			
	12 11/11	Draft team mission	Pro-tips: professional communication	Team Mission Statement

		statement: 30 minute timebox		
	13 11/18		Project focus	
	14 11/25		Demos, reflection, feedback	
	15 12/2		Course Finale & Celebration	ZOOM Student Presentations

Workshop Topics

Workshops and Guest Speakers will reinforce domain knowledge. Student teams will integrate and demonstrate application of this domain knowledge in their projects. Topics may include:

- Design Thinking
 - Human Centered Design
 - Design Thinking for Social Systems
 - Customer Development from Lean Startup (Steve Blank)
- Ethics of Innovation: Ethics Guided Design
- Sustainability: Design for Sustainability
- Developing and Evoking Empathy
 - Developing Empathy: use of tools including shadowing, interview, focus group and survey
 - Evoking Empathy: Effective storytelling through photo collage, presentations, writeups, videos
- Intellectual Property
- Compelling written and oral technical communication
- Recognized “Codes of Ethics” and “Codes of Conduct” from Engineering and Multidisciplinary Societies
- Codes and Standards

Assessments

Weekly Timescale: Student teams receive regular assessments from peers and the teaching team (in class working sessions) and mentors (meetings outside of class), on a weekly timescale.

Monthly Timescale: Student teams receive assessments of their team’s project progress at milestone points at the end of each of 3 Agile Sprints. Students receive feedback from peers and teaching team on individual participation.

Semester Timescale: Student teams receive assessment of final project through the in-class Course Finale which will include an independent panel

Grading

85% Project - all team members are expected to participate on a weekly basis

40% Development Process, As demonstrated and assessed during Sprint 1, 2 and 3

- Teams demonstrate use of Design Thinking, Lean Startup (Agile Engineering, Customer Development) and Ethics of Innovation within project
- Teams develop, measure and improve their project-specific iterative development process; project dashboard
- Teams apply Ethics Guided Design in their process

25% Weekly 'Lessons Learned' presentations and team assignments

- Technical Development - prototype, test, modeling/simulation, documentation
- Vision, Elevator Pitch, Executive summary, Video

20% Final Presentation

15% Individual participation, judged at the discretion of the instructors. Up to 10% (two-thirds of your individual participation score) may be informed by input from performance feedback by your teammates at the end of each Sprint judged at the discretion of the instructors.

Integrity in project work, reporting, and peer evaluation is expected according to the UTEP Academic Honesty Policy. See Academic Honesty section in this syllabus for more information.

<https://www.utep.edu/student-affairs/osccr/student-conduct/academic-integrity.html>

Weekly presentation format ~ 5 min ~

Note - presentation content is of team progress and your project learning... not a recap of course based learning

Slide 1 - Cover Slide / Project Dashboard

<u>Who we are</u> Team Name & Logo Elevator Pitch Team members / roles Market Size (TAM, SAM, TM) and did it change this week	<u>Agile Engineering & Stakeholder Development</u> Engineering Analyses / Designs / Simulations (this week, cumulative) Prototypes built (this week / total) Test protocols completed (this week / total) Total D>B>T cycles to date Stakeholder conversations (this week / total)
Key Accomplishments this week, What's Next, Blockers/Risks	

Slides 2 and following

Agile Engineering - technical presentation

Customer Discovery - who you talked to, what you learned

Final Slide Process improvement and & key learnings (1-3) as appropriate

- **Process Improvement idea for trial next week**
- Design Thinking Core concept/technique applied this week: techniques from Field Guide (inspiration, ideation, implementation)

- Agile Engineering takeaways
- Ethics guided Design takeaways

Closing> Not Presented: screenshot or switch to your Sprint Planning Board

Sprint Review & Final Presentation Format **TBA**

Course Materials and Additional Resources

THE FIELD GUIDE TO HUMAN CENTERED DESIGN, by IDEO.ORG. Download from designkit.org [FIELD GUIDE]

Supplemental video lectures on customer development for flipped classroom will come from Steve Blank [Udacity lecture videos - "How to Build a Startup"](#)

See **Resources** document

Course Methods & Technology Stack

The technology stack is aimed to help your team learn industry-relevant tools and execute on an agile-based approach to your project. Develop an effective way to work within your team:

- Weekly scrum
- Weekly mentor checkin
- Rotate roles and share the burden

Required Elements

- *Agile approach: Create a team working session schedule that supports weekly progress on the project. Share with the teaching team access to the software tools that your team uses*
- Onshape
- Simulation, for example with Ansys Discovery or Fusion 360
- Smartsheet
- Slack
- Google: Google Drive folder for your team, research, presentations, and other materials.

Recommended

- [Zoom](#): video conferencing for web or mobile. Free version.

Contributions of Course to Meeting the Professional Components and Program Objectives:

This capstone project based course provides professional development in content mastery and critical cognitive skill development for students of all majors across the University.

Human Centered Design Component: through purpose-driven entrepreneurial projects, students will gain practical experience and demonstrate mastery in applying Human Centered Design Mindsets and Methods.

Customer Development component: students will gain practical experience obtaining direct feedback from customers / stakeholders to guide product and company development.

Agile Engineering component: This course will require the application of engineering analysis and technical problem solving to real-world, open-ended problems. Students will frame problems and use technical analysis, prototyping, and testing to evaluate hypotheses and advance development.

Ethics of Innovation component: Students will be introduced to Ethics and Ethical Decision Making. Building on these concepts, students will apply Ethics Guided Design™ to their projects, including resolving ambiguity and tension among project outcomes in the disparate dimensions of human dignity & environmental stewardship and sustainability.

Critical Skills Development: The course will also give students experience and development of additional critical skills including leadership, teamwork, external collaboration, communication, and critical thought -- through workshops and direct application to in project work.

UTEP & ME Department Policies

ACES & Tutoring Center

Please note there are tutoring services available in the ACES center. Tutoring is free to you; the Department pays them. If tutors are not used, the Department may stop funding them. Check the schedule of the tutors and make use of the services. For more details visit the

ME Advising Blackboard -> cc mech acadav: MECH Academic Advising -> Tutoring & Resources

At the link you can find tutor schedules, location of the ACES center and the list of tutors available. For more information send email to METutors@utep.edu

Academic Honesty

During exams and quizzes, you are not allowed to use any form of wifi enabled electronic device, including cell phones or other electronic communication devices or methods (wrist watches, earbuds, etc.). No wrist watch or other electronic device may be worn. Calculators and watches may be subject to inspection. You may be asked to temporarily remove glasses to allow for their inspection.

You may not bring backpacks, hats, bulky coats or hoodies into the exam room. Lockers are not available at the exam site so plan and leave your belongings in a secure location. You may NOT sit them in a corner of the exam room.

You must show your work for all problems. You must use the paper provided by the instructor. If no work is shown you may not receive credit. After the exam, the instructor may require you to explain how you solved a problem on the exam. If you refuse to or cannot explain your work you may be subject to disciplinary action.

No electronic version of the book, loose paper print-outs of the book or extra sheets of paper of any kind are allowed unless explicitly mentioned in writing by the instructor. As a part of the zero-tolerance policy, if you have a cellphone or other electronic device capable of communication on your person; or if any proctor sees or hears any electronic device during the exam or if you share your work with someone else, you will be reported to the proper authorities and you may receive a zero on the exam or an F in the class. Other actions including suspension may also be pursued.

No one will be allowed to leave the room during an exam. This includes restroom breaks.

University approved recording devices may be located at various locations in the room and may be out of sight of the students. These recordings will be managed according to the UTEP approved regulations for such media. The instructor may create a record of your activity during the exam and may take photographs of your work during the exam.

If you are suspected of scholastic dishonesty you may or may not be directly confronted about your conduct by the instructor or proctor. You will however, be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) and your exam may not be admissible. Your grade in the class may not be available until OSCCR makes a final ruling, this may adversely impact your ability to enroll in other classes.

If you arrive more than 15 minutes late to an exam, you will not be allowed to take the examination.

There will be no makeup exams administered. If you have a university approved excuse, your instructor will have a process for determining how to handle the missing grade outlined in the syllabus. However, no makeup exams will be given.

If you miss more than one exam, the instructor may choose to administratively drop you from the class. This may adversely impact a visa and financial aid.

No food or drink may be brought into the examination room.

Departmental policy allows for the use of assigned seats. All students must present their UTEP issued ID prior to and during every exam and may be required to sign in. Not having a UTEP issued ID when asked will result in forfeiture of the exam. No other IDs will be accepted.

Scholastic dishonesty on homework, lab assignments and all other class assignments will be held to the same standards and requirements of academic honesty as quizzes and exams.

Class Attendance Policy

Attendance is mandatory. Anyone with 5 or more absences will be dropped from the class. A drop for not attending will count toward the State Allowed Six Drop Limit. If you are failing the class at

the time of the drop you may also be given a WF designation. Be advised that a drop could adversely impact visa status, financial aid and other programs.

As per UTEP rules, you may be asked to show a UTEP ID at any time during class. Anyone who is present and not registered in the class will be subject to disciplinary action unless the instructor gives prior approval.

Excused Absence for Exams

The UTEP catalog allows Exam Absence to be excused ONLY for University-Recognized Activities and very specific other situations. Medical absence is NOT allowed in the UTEP catalog. For consistency with the catalog, students will NOT be excused from exams due to illness.

Harassment Policy

The University (see Handbook of Operating Procedures 1.2.2.4) has a zero-tolerance policy for harassment. Engagement in any behavior considered harassment will be reported to the proper authorities. In addition to generally understood forms of harassment, the department also treats the following behavior as harassment:

- Repeated emails and/or calls regarding subjects that have already been addressed. Once a decision has been made or a question answered, a student who continues to ask the same question will be given a warning by the recipient of the email/call. If the student continues, the behavior will be reported. Questions that seek understanding of course material are not harassment; but repeated questions about a grade or an administrative decision are.
- Grades are NOT negotiable, ever. If you believe a grading mistake has been made, you must follow the process described in the UTEP catalog. Any request for a grade elevation that is NOT based on a mistake is considered harassment and will be reported immediately.
- Remaining in an office after the occupant requests you leave is considered harassment and potentially threatening. You will be reported immediately without warning and depending on the severity, may be reported to law enforcement.
- Similar behavior towards department staff, and student advisors will also be treated as harassment, including persistent phone calls, emails, and badgering. Department staff and student advisors are there to help students, and should be treated with due respect.