

BIOE 273, MED 273 Biodesign for Digital Health

Fall Quarter – Academic Year 2019/2020

Rev. 09.05..2019

Health care is facing significant cross-industry challenges and opportunities created by a number of factors including: the increasing need for improved access to affordable, high-quality care; growing demand from consumers for greater control of their health and health data; the shift in focus from “sick care” to prevention and health optimization; aging demographics and the increased burden of chronic conditions; and new emphasis on real-world, measurable health outcomes for individuals and populations. Moreover, the delivery of health information and services is no longer tied to traditional “brick and mortar” hospitals and clinics: it has increasingly become “Digital,” enabled by apps, sensors, wearables and the cloud; simultaneously, it has been augmented and often revolutionized by emerging digital and information technologies, as well as by the data that these technologies generate. This multifactorial transformation presents opportunities for innovation across the entire cycle of care, from wellness, to acute and chronic diseases, to care at the end of life.

But how does one approach innovation in digital health to address these health care challenges while ensuring the greatest chance of success? At Stanford Biodesign, we believe that innovation is a process that can be learned, practiced, and perfected; and, it starts with a need. In Biodesign for Digital Health, students will learn about digital health and the Biodesign needs-driven innovation process from over 30 industry experts. Over the course of ten weeks, these speakers join the teaching team in a dynamic classroom environment that includes lectures, panel discussions, and breakout sessions. These experts represent startups, corporations, venture capital firms, accelerators, research labs, health organizations, and more. Student teams will take actual digital and mobile health challenges and learn how to apply Biodesign innovation principles to research and evaluate needs, ideate solutions, and objectively assess them against key criteria for satisfying the needs. Teams take a hands-on approach with the support of need coaches and mentors from industry. On the final day of class, teams present to a panel of digital health experts and compete for project extension funding.

IMPORTANT: Enrollment by application only. Applications open May 28 and closes September 6. Acceptance decisions are announced on or before September 20. Up to 32 students will be admitted into the course.

APPLY ONLINE AT: <https://tinyurl.com/y42kx87g>

Units: 3 units

Day/Time/Location: The class starts on September 25, 2019 and ends on December 4, 2019. Following regular class hours on December 4, a ceremony will be held at Stanford Biodesign to award the top student projects.

Wednesdays 3:30 – 6:20 pm

Li Ka Shing Center, LK102

A combination of lectures, panels, and breakout sessions.

Fridays 11.30 – 1:20 pm

Fridays are for team project work and workshops. There are **four** mandatory workshops that all students must attend, and **one** optional workshop that is strongly encouraged:

September 27, 2019: “Team Kickoff”

Needs assignment and team exercise
(pizza included!)

October 11, 2019: “Intellectual Property in Digital Health”

William Kim, Partner & Owen Allen, Counsel |
Wilmer Hale

October 18, 2019: “Digital Health Regulatory Topics”

Grace Bartoo, President & CEO | Decus Biomedical

November 8, 2019: Optional: Design Workshop (90 minutes)

Ryan Brewster | course alum
Schedule your 20 minute slot with the TA

November 15, 2019: “Sales and Investor Presentations”

Bob Kocher, MD, Partner | Venrock

The four mandatory workshops will run from 12:00-1:00 in Clark S361, located in the seminar area on the 3rd floor of the South wing of the Clark Center (accessible by going through Peet's Coffee). Please use the time before/after the scheduled session to meet with your team.

The optional design workshop will run from 11:30-1:20 and will be held in the Biodesign studio, Clark E126.

On days when there is no scheduled workshops, students are invited to work in the Biodesign studio, Clark E126, but can meet at any location that's convenient for the team.

Course Materials:

No textbook is required. **See the reading list at the end of this syllabus for an overview of course reading materials.** Access to each reading assignment will be available via Canvas. Students are expected to complete assigned readings before each class session.

Additional course materials on Canvas include information on guest speakers and real-world examples of digital health technologies. Presentation slides from the speakers who give consent will also be posted.

Course Communications:

Canvas: Canvas will be used for all formal class communications and the submission of assignments.

Slack: Students will be invited to join a class Slack channel for informal questions and collaboration. We will provide the Slack handle on the first day of class. If you haven't already downloaded Slack, please do so!

GOALS FOR THE COURSE

At the end of this course, students will:

- be able to ask informed questions and apply critical thinking to understand the evolving digital health industry sector;
- be able to recognize, describe and apply the needs-driven Biodesign approach to the creation of innovative concept solutions in digital health;
- have developed or refined the soft skills required to work in teams and with the support of external advisers and mentors towards achieving and presenting digital health projects outcomes.

TOPICS COVERED

Biodesign process + digital health:

- enabling technologies
- design thinking
- policy
- value
- financing
- entrepreneurship
- corporate strategies

INSTRUCTIONAL METHOD

The Biodesign for DigitalHealth course is taught by a combination of faculty from Stanford University and other organizations, as well as invited speakers from the digital health industry and entrepreneurial community. Students will devote significant time and effort working in teams, with the guidance of need coaches/mentors and independently. The course provides a unique chance to gain real-world insights; to acquire or refine the soft-skills necessary to work in multidisciplinary teams and interact with outside experts; to build a relevant network of digital health enthusiasts and professionals; and to learn about career paths in health innovation.

The typical format of a Wednesday afternoon in the classroom is:

3:30 – 4:25 pm	Lecture, Team Activity
4:30 – 5:15 pm	Breakout Session
5:20 – 6:20 pm	Panel Discussion and Networking

STUDENTS RESPONSIBILITIES

Amount of Work Expected

Teams have reported up to 7-9 hours of work each week beyond classroom hours. A majority of the effort is spent researching needs, meeting need coaches and mentors, interviewing stakeholders, and ideating solutions as a team.

Absences

No more than one unexcused absence is permitted. A second absence may be permitted with written justification by the student and make-up work negotiated with his/her team members on the course project. Please communicate absences to the TA in advance whenever possible. More than two absences will lead to a No CR grade or will reduce the student's final grade by one full letter grade.

GRADING

3 Units – CR/No CR or Letter Grade

Students may elect to attend the course for CR/No Cr or for a Letter Grade. In addition to attending classes, completing readings, and participating actively in the classroom environment, students are required to complete a class project exploring a need in digital health. See the Class Projects section below for more information.

Grading will be based on:

- 10% **Attendance** in class; no more than 2 absences are allowed (see attendance policy above).
- 10% **Individual and team class participation**; participation will be assessed by the teaching team and TA in class discussions, project team meetings, and via feedback gathered via peer evaluations.
- 10% **Peer evaluations**: in a confidential surveys, students are asked to evaluate their teammates for dependability, effort, quality of work, attitude, and initiative. Students will be sent a CATME link to the survey halfway through the semester and at the end of the semester.
- 15% **Needs presentation** given Wednesday, October 23; project teams should share presentation

responsibilities.

15% **Concept design presentation** given Wednesday, November 23.

40% **One-page project summary and final presentation** delivered on *Wednesday, December 4*. All team members must be present on this date. Project teams should share presentation responsibilities. The slide deck (powerpoint or pdf) must be submitted in advance and no later than 11:59 pm on **Monday, December 2**.

CLASS PROJECTS

Students will be matched into teams of approximately four members based on the information they provided on the course application. As a group, the team will choose a project from the need areas that have been sourced by the teaching team. The team will then research and evaluate the chosen need area, draft and refine a focused need statement based primary and secondary research, ideate solution concepts, and objectively assess them against key criteria for satisfying the needs.

Project progress will be tracked via a “team card” that is updated at regular intervals by the team, in addition to three in-class presentations. The schedule is outlined below:

- October 1 by 11:59 pm - First draft of need statement (submitted via team card)
- October 8 at 11:59 pm - Revised needs statement based on additional need research (submitted via team card)
- October 15 by 11:59 pm - First draft of need criteria (submitted via team card)
- October 23 by 11:59 pm - Needs presentation (submitted via Canvas and presented during class)
- November 12 by 11:59 pm - Concept presentation (submitted via Canvas and presented during class)
- December 2 by 11:59 pm - One-page project summary and final presentation (submitted via Canvas); to be presented on the last day of class presentation format, December 4

The key criteria we are looking for in the project deliverables are **(1) understanding of the need** and **(2) representation of the biodesign innovation process** from need finding to concept generation and screening. The first is paramount and involves a clearly formulated and well-researched need statement. The second involves a strong process towards solution generation and selection (**originality** and **potential for impact** will be praised), with attention to opportunities for technical development (**feasibility**) and delivering strategies (**sustainability**, as can be achieved after thorough understanding of the competitive and stakeholder landscape and the market viability).

By focusing on the need and how students have applied the innovation process to address it, teams will demonstrate that their solution has a reasonable likelihood of being accepted by all stakeholders. In evaluating the projects, we will place greater emphasis on evaluating the caliber of the research performed and what students have learned. High quality of content and deliverables is most important, and is always preferred over quantity with limited insight. Additional information on the final presentations and past examples of project papers and slides will be distributed in November.

The top teams chosen by the final presentation panelists on December 4 are eligible to continue working on their projects through the **Biodesign NEXT** extension funding program. Students who participate in Biodesign NEXT can register for additional credit and receive ongoing mentorship, as well as extension funding for 1-2 additional quarters. More information about this opportunity will be provided in class.



CONTACT INFORMATION

Course Directors

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COURSE CULTURE

We are committed to affirming the identities, realities, and voices of all students, especially those from historically marginalized or underrepresented backgrounds. This course values the use of person-centered language and preferred gender pronouns, and respect for the experiences of others.

STUDENTS WITH DOCUMENTED DISABILITIES

Students who may need an academic accommodation based on the impact of a disability must initiate the request with the Office of Accessible Education (OAE). Professional staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for faculty dated in the current quarter in which the request is made. Students should contact the OAE as soon as possible since timely notice is needed to coordinate accommodations. The OAE is located at 563 Salvatierra Walk (phone: 723-1066, URL: <http://studentaffairs.stanford.edu/oae>).

WEDNESDAY CLASS CONTENT: A WEEK-BY-WEEK VIEW

Class 1 September 25, 2019 Introduction; Overview of Digital Health

3.30PM-4.20PM	LECTURE	Course Overview/Team Card Introduction Digital Health Framework Biodesign Process Overview How Digital Health Can Expand Opportunities in Need-Driven Innovation
4.30PM-5.15PM	KEYNOTE	Digital Health Landscaping
5.15PM-5.50PM	PRESENTATIONS	Guest Presentations Examples of digital health innovations from past students
5.55PM-6.20PM	NETWORKING	

Lecture

Oliver Aalami, Stanford Byers Center for Biodesign
Michelle de Haaff, Stanford Byers Center for Biodesign
Rusty Hoffman, MD Founder, Grand Rounds and Medical Director, Digital Health Care Integration, Stanford Healthcare

Keynote

Glenn Snyder, Deloitte Medical Technology Practice Leader
Laura Paulson, Deloitte Medical Technology Practice Leader

Presentations

Alumni Guests (All Biodesign NEXT winners and funding recipients):

- Team NuLeaf, BIOE273 2016
- Team Digex, BIOE273 2018
- Team Remote PT, BIOE273 2018
- Team Medication Adherence BIOE273 2018

This week’s Friday workshop is:

September 27, 2019 at noon: Workshop: **“Team Kickoff”**
Needs assignment and team exercise (pizza included!)

Class 2: October 2, 2019

Digital Health Needs

3.30PM-4.20PM	LECTURE	Biodesign Process: Needs Finding
4.30PM-5.15PM	BREAKOUT SESSION	Teamwork time: Discuss first draft of need statements and develop research plan with Biodesign Innovation Fellows
5.20PM-6.20PM	PANEL	Digital Health Needs

Lecture

James Wall, Stanford Byers Center for Biodesign

Panel

MODERATOR:

James Wall, Faculty, Stanford Byers Center for Biodesign

GUEST PANELISTS:

- Jacqueline Shreibati, MD, MS, FACC, Medical Director, Alivecor
- Julia Hoffman, Psy.D., National Director for Mobile Health in Mental Health Services, US Department of Veterans Affairs
- Marianne Berkovich, Head of User Research & Customer Insights, Glooko (former Google UX Lead)
- Pelu Tran, CEO Ferrum Health

Class 3 October 9, 2019

Enabling Technologies

3.30PM-4.20PM	LECTURE	Biodesign Process: Needs Screening and Criteria Selection
4.30PM-5.15PM	BREAKOUT SESSION	Teamwork time: Review revised need statements with teaching team
5.20PM-6.20PM	PANEL	Enabling Technologies (and how they connect to needs)

Lecture

Lyn Denend, Director of Academic Programs, Stanford Byers Center for Biodesign

Panel

MODERATOR:

Michelle de Haaff

GUEST PANELISTS:

- Allison Darcy, Founder, Woebot - invited
- David Kuraguntla, CEO GraftWorx
- Gloria Lau, Serial Entrepreneur, Data Scientist, Alpha
- Jiang Li, CEO Vivalink
- Ian Shakil, CEO & Co-Founder, Augmedix, Inc.

This week's workshop is:

October 11, 2019 at noon: Workshop "**Intellectual Property in Digital Health**"
 William Kim, Partner & Owen Allen, Counsel | Wilmer Hale

Class 4 October 16, 2019

Designing for Health

3.30PM-4.20PM	LECTURE	Biodesign Process: Concept Generation and Screening
4.30PM-5.15PM	BREAKOUT SESSION	Teamwork time: Discuss preliminary need criteria with Biodesign Innovation Fellows and update research plans
5.20PM-6.20PM	PANEL	Designing for Health

Lecture

Varun Boriah, Founder, CEO, Lully Sleep
 Oliver Aalami, Stanford Byers Center for Biodesign

Panel

MODERATOR:
 Pablo Pantaleoni, Head of Design, Headspace

GUEST PANELISTS:

- Farzad Azimpour, Chief Medical Officer, MYIA Labs & Assistant Director (Design), Stanford Biodesign
- Dennis Boyle, Founding Partner at IDEO
- Clare Purvis, Director, Behavioral Science at Headspace
- Daniel Schlosser Associate Product Manager, Google - Invited
- Trina Histon, Kaiser - Invited
- Hannah Williams, IDEO - Invited

This week's workshop is:

October 18, 2019 at noon: **Workshop "Digital Health Regulatory Topics"**
 Grace Bartoo, President & CEO | Decus Biomedical

Class 5 October 23, 2019 Policy

3.30PM-5:15PM	TEAM ACTIVITY CASE STUDY	Need presentations (6 minutes per team, followed by 6 minutes of discussion) Introductory Case Study on Policy - Omada Health
5.20PM-6.20PM	PANEL	Digital Health Policy Panel

MODERATOR:
Deven McGraw, former HHS officer

- GUEST PANELISTS:**
- Lucia Savage - Head of Policy at Omada - will present a case study prior to getting started
 - Christine Sublett, HIPAA security expert - Invited
 - Jared Seehafer, Co-founder of Enzyme - Invited
 - FDA panelists * - specific FDA attendees TBD

Class 6 October 30, 2019

Business Models / Validation

3.30PM-4.20PM	LECTURE TEAM ACTIVITY	Business Model and Validation CATME (peer-peer evaluation #1)
4.30PM-5.15PM	BREAKOUT SESSION	Teamwork time: Brainstorming
5.20PM-6.20PM	PANEL	Business Models and Validation

Lecture

Oliver Aalami, Stanford Byers Center for Biodesign
Michelle de Haaff, Stanford Byers Center for Biodesign

Panel

MODERATOR:
Chrissy Farr, Health Reporter, CNBC - Invited
Bill Evans, Managing Director, Rock Health

GUEST PANELISTS:

- Peter Haim, CEO Big Health
- Uday Kumar, iRhythm founder
- Alex Morgan, Khosla Ventures
- Vineeta Agarwala, Venture Partner, Google Ventures - Invited
- Jasmine Shih, Program Management Office / Entrepreneur

Class 8 November 13, 2019 Corporate Perspectives

3.30PM-5:15PM	TEAM ACTIVITY	Concept presentations (6 minutes per team, followed by 6 minutes of discussion)
5.30PM-6.20PM	PANEL	Corporate Perspectives

Lecture:

No Lecture Today (Team Activity Only)

Panel: Corporate Perspectives

MODERATOR:

Christopher (Topher) Sharp, MD; Chief Medical Information Officer Stanford Hospitals and Clinical Professor of Medicine, Stanford School of Medicine

GUESTS

- Jonathan Wilt, CTO, InnovationOchsner, Ochsner Health System, Louisiana
- Jonas Thinggaard, Head of Technology Scouting and Incubation at Novo Nordisk
- Alex Gao, Director of Digital Health Lab Samsung
- Vic Tanden, Blue Shield of CA
- Carolyn Schmitz - Medtronic Diabetes
- David Van Sickle, CEO/Founder Propeller Health
- Michael Mcconnell, Head, Cardiovascular Health Innovations for Verily-Invited
- Divya Nag, Director of Health, Apple - Invited

This week's workshop is:

November 15: Workshop: "Sales and Investor Presentations"
 Bob Kocher, MD, Partner, Venrock

Class 9 November 20, 2019 Mentor Day

3.30PM-6.20PM	TEAM ACTIVITY	Mentor Day
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Mentors and teams gather on campus for at least one hour for a project review session.

November 27, 2019 *Thanksgiving Break*

December 4, 2019 **Final Presentations, Reception & Awards**

3.30PM-6.00PM	TEAM ACTIVITY	Teams present a full, 10-15 slides presentation of their project to the class and a judging panel. All students must present. CATME (peer-peer evaluation #2)
6.30PM-7.45PM	NETWORKING	Winning teams are announced and awarded. Food and drinks are served in a casual atmosphere at Stanford Biodesign in the Clark Center, encouraging networking among students, faculty, and the final presentation panelists.

Final Presentation Panelists Include:

- Paul Yock, MD, Director, Byers Center for Biodesign
- Rick Altinger, Digital Health Start-up Founder
- Iana Dimkova, Investor GE Healthcare

Final presentations are held at an auditorium LK102 classroom in the Stanford medical campus. After final presentations we will move to the Stanford Biodesign studio for a celebration.

Biodesign for Mobile Health, Fall 2019

Reading List

Month	Day	Lecture, Team Activity	Reading List
Pre-read			Biodesign; The Process of Innovating Medical Technologies: Process Insights pp39.-pp.46
September	25	Introduction, Team Formation	Why do digital health startups keep failing? Paul Yock, Fast Company Magazine; 10.17.18
October	2	Needs Finding & Exploration	Glooko Inc., Case Study Getting the Need Right Biodesign; The Process of Innovating Medical Technologies: Part I: Identify Section 1.2 Needs Exploration pp. 67-pp. 89
October	9	Needs Criteria Selection	Sandstone Diagnostics Case Study Need Criteria as a Guiding Light Slow Ideas , The New Yorker Magazine; Atul Gawande, JULY 29, 2013
October	16	Concept Generation & Screening	Ginger.IO Case Study User-Focused Ideation and Design
October	18	Workshop “Digital Health Regulatory Topics”	FDA Medical Device Classification Overview Digital Health Software Precertification (Pre-Cert) Program, FDA
October	23	Activity: Teams Presents Needs	
October	30	Presenting your mHealth Story	Evidation Health Case Study Demonstrating Value
November	6	Evaluating a Business for Success	Omada Health Case Study Establishing Long-Term Business Viability Biodesign; The Process of Innovating Medical Technologies: Part II: Invent Section 3.2 Initial Concept Selection pp. 268-279
November	13	Activity: Teams Present Concepts	

November	20	Mentor Day: Work on Final Paper, Presentation
November	27	<i>Thanksgiving Break - No Classes Today</i>
December	4	Final Team Presentations followed by Reception & Awards

Additional Recommended, but Optional Reading

Reinventing American Health Care: How the Affordable Care Act Will Improve Our Terribly Complex, Blatantly Unjust, Outrageously Expensive, Grossly Inefficient, Error Prone System. March 4, 2014. By: Ezekiel J. Emanuel

Abbreviated Calendar

Wednesday Class (c)/ Friday Workshop (w)

		Lecture, Team Activity, Workshop	Panel
September (c)	25	Introduction, Team Formation	Opening (Keynote, Presentations)
September (w)	27	Team Kickoff	NA
October (c)	2	Needs Finding & Exploration	Digital Health Needs
October (c)	9	Needs Criteria Selection	Enabling Technologies
October (w)	11	Intellectual Property in Digital Health	NA
October (C)	16	Concept Generation & Screening	Designing for Health
October (w)	18	Digital Health Regulatory Topics	NA
October (c)	23	Activity: Teams Present Needs	Policy
October (c)	30	Presenting your mHealth Story	Business Models / Clinical Validation
November (c)	6	Evaluating a Business for Success	Entrepreneurship
November (w)	8	Design Workshop (Optional)	NA
November (c)	13	Activity: Teams Present Concepts	Corporate Perspectives
November (c)	15	Sales and Investor Presentations	NA
November (c)	20	Mentor Day: Work on Final Paper, Presentation	
November	27	<i>Thanksgiving Break - No Classes Today</i>	
December (c)	4	Final Team Presentations followed by Reception & Awards	

BIOE 273 | MED 273

A course offered by:



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