

HINF 5301: Evaluating Health Technologies

Khoury College of Computer Sciences & Bouvé College of Health Sciences

Spring 2023

Class Location: Ryder Hall 161
Credit Hours: 4 SH
Class Time: Wednesdays 6:00-9:00 PM
Message Board: Canvas: <https://northeastern.instructure.com/courses/137614>

Instructor of record: [Stephen Intille](#), Ph.D.
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(If you are unable to make this time, please reach out.)
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Why should you study the evaluation of (novel) health technologies?

Figuring out how to help people stay healthy and recover from illness is one of society's grand challenges. Industrialized countries are struggling to care for their citizens, and the cost of that care is rising rapidly. In the U.S., we don't have a healthcare system, we have a "sick care" system. We wait until people are sick, and then we spend substantially more time and resources helping those sick people recover than we probably would have spent keeping them well in the first place. This is distressing, and technology may provide a partial solution. Can we use innovative new computing technologies such as smartwatches, head-mounted computers, virtual reality, "smart" speakers, AI-driven chatbots, in-home sensors, and other devices to build patient- or person-facing technologies that help people stay well *before* they get sick, or that help people recover from illness more effectively? Can we use those same technologies to help people who have chronic conditions cope with everyday challenges? Will new technologies completely transform how we think about healthcare today to enable completely new models of care that are not possible without the technology?

In this class, you will work as an individual and in teams to *practice* conceptual development of new ideas that could transform healthcare as we know it. The best ideas may sound unconventional at first, but your challenge will be to justify the ideas based on past systems and research, and then to practice developing evaluation plans that would be necessary to convince others that your ideas have merit. You will do this, with your peers, in a series of four design charrette exercises, where you will be given a challenge and then do brainstorming, research, and method development to make the case that your innovative idea could be feasibly evaluate and subsequently dramatically and positively disrupt the healthcare system.

As you do this in this interactive, seminar course, you will think about the design of innovative personal health, human-computer interface technologies. Examples include consumer wellness

promotion applications, assistive technologies that aid persons with disabilities, patient education and counseling systems, interfaces for reviewing personal health records, and eldercare and social network systems that monitor health and support independent living.

Why will this course give you a new perspective on healthcare and technology?

This course is being redesigned from the way it was run in the past, in consultation with a set of faculty who work in the field of personal health informatics. We want this course to challenge you to think about how to leverage the capabilities of technologies in innovative new ways that nobody else, other than you and/or your team, may have thought of yet. This is, not surprisingly, difficult to do, but we will try to use a structured, iterative learning and ideation process to do it.

Along the way, we will briefly survey and critique related academic topics such as personal health informatics, theories of health behavior change that might be useful in innovative health systems, and various methodologies for demonstrating health technology efficacy and effectiveness. By reading about and discussing case studies of other systems, we will generate some new ideas about how we might evaluate ideas of our own.

How might this course help you in your career?

In this course, you will acquire practical experience generating novel ideas for healthcare technology, scientifically justifying those ideas, and making compelling arguments for how to evaluate those ideas. Essentially, you will learn how to, and practice, developing ideas for innovative health technology, and compellingly conveying your ideas to a scientific audience in a written and oral form. You will also practice working in small teams.

In each of four design charrettes, you will work individually or in a team to:

- Iteratively generate a novel idea that could solve a problem that will be given to you
- Conduct background research to understand what is known about the problem and related solutions, including relevant health behavior change theory
- Create a design sketch of the idea that makes a convincing case the technology could be built for prototype testing
- Iteratively develop an evaluation plan for the proposed technology, assuming the prototype can be built
- Document the strengths and weaknesses of the evaluation plan
- Place the proposed solution in context, discussing ethical, societal, and practical implications of the solution being proposed
- In aggregate, justify the potential of your idea and, through your writing and presentation, inspire others such that the scientific community will consider the idea seriously

As you do this, you will also be learning to provide feedback to other students engaged in the same process, but with different challenges.

While you work on conceptualizing and scientifically justifying your ideas for novel health technologies, you will enhance other core skills that will be extremely important in your career: public speaking, writing, planning, organizing, prioritizing, and communicating with collaborators.

When you are done with this course, you will have developed at least four ideas that, hopefully, could be turned into actual future research and development projects, should you so choose.

What's the history of this course?

This course has been offered several times in the past. In those offerings, students primarily worked on a single project with a team, deploying a prototype technology and evaluating it. While this structure has merit, students also reported it was somewhat duplicative with other courses (e.g., Empirical Research Methods). Also, often the students ended up working with a technology that they were not personally interested in.

We have elected to change this course this semester, to provide students with an iterative experience conceptually developing ideas and plans for their evaluation. We believe this will provide more value to more students taking the class – both PhD students and MS students – and possibly be more likely to jumpstart new and innovative real-world development projects among the students in the class. Because it will be a new structure, your feedback as we go through the semester will be particularly important, and I will adjust the course content as we go and in response to the backgrounds of the students in the course.

What do you need to know before you take this course?

It's not required, but it will be helpful to you if you have experience with one or more of the following topics: research methods, human-computer interaction, health data analytics, behavioral science/psychology, or any general courses on health and wellness. If you have deep knowledge or work experience in a particular technology, health, or wellness domain, it will enhance our class discussions.

What will you be able to do by the end of the course?

You will be able to:

- Describe what personal health interface systems are and why they are important,
- Explain how personal health interface systems may impact healthcare delivery,
- Describe how emerging human-computer interaction technologies may change the design of such systems and create opportunities for new innovations,
- Describe some of the software technologies used today to build and evaluate personal health interface systems in research projects,
- Develop ideas and a detailed proposal for the application of a novel technology to solve a health problem, providing background research, a general research plan/method, a well-justified method of evaluation, and discussion of potential impact on research,

health outcomes, and policy, as well as discussion of ethical and practical considerations,

- Compare and contrast innovative health technologies and the underlying theories and methods,
- Critically evaluate/examine the utility of various personal health technologies for different health outcomes and populations,
- Critique study designs and research proposals and papers describing new health technologies, and
- Write and present well researched ideas describing potential personal health informatics research and/or development projects, placing the ideas in context of past and current research in personal health informatics.

How will the class work?

The class will meet once per week in the evening. This style of course meeting is not the most effective for learning, but it is what we have been given for this course for this semester. We will make the best of it.

All classes will be interactive – we will combine working with active mentorship and peer feedback. You and your peers will actively work to help one another, with me as the guide. You will participate in discussions and short exercises to help you generate new ideas or critique ideas from others. In some classes you, or you and your team partner, will present your work so far and receive critique from me and the other students in the class. **You will need to be prepared for every class to make these discussions and exercises worthwhile.**

For some classes, you will prepare short presentations on the material to provoke discussion or update others on your thinking on the current design charrette. Weekly readings will consist of research papers or other articles that help the class as a whole evaluate the concepts they propose.

For each charrette, you and your partner, or you (when working independently) will be responsible for writing a modest-length, high-quality paper that describes and justifies your idea and evaluation plan. This will be written in a scientific style, where statements must be supported by prior work, and that unequivocally conveys that you have thought deeply about the topic and done your research, and taken into account the feedback you will get on the ideas in each class.

How will the design charrettes work?

You will be assigned a teammate (or two), and then through a roll of our personal health informatics story cubes, you will be assigned a challenge to address with a theory, population, technology, and domain. You will then have 3-4 weeks (depending on the charrette) to ideate, understand the problem, conduct background research, develop a solution, and propose an evaluation plan for the solution. As you do this, you will get feedback from others each week. In

the last week, you will present your idea and submit a paper that describes the idea. Students will critique your idea and provide additional feedback in a mock review session.

For each charrette solution, you will need to discuss the following topics (each a section in your report: motivation for the idea, prior work, your innovative solution (and why it is innovative and based on theory), the proposed design of your solution, your testing/evaluation plan (including participant recruiting, inclusion/exclusion, compensation), a timeline, what you will measure and your methods for doing so, how you would analyze the data, and the scientific significance of the work if you were successful. You will also discuss ethical considerations, risks and limitations, and larger societal impact if your proposed solution were to work.

Each 3-4 week period will be an intense, deep dive into a new area. You will be challenged to think creatively within a set of constraints and to learn about new topics in personal health informatics as you do.

In-class exercises, which will mostly consist of discussions with your peers, will help you develop the ideas.

What materials will I read for class?

To succeed in this course, you will need to do quite a bit of reading outside of class each week as you develop your ideas. You can expect to be assigned several readings, and then you will need to find readings on your own. Expect to be spending at least five hours a week doing research and reading.

The assigned readings are intended to be thought provoking and to help you generate new ideas about personal health informatics solutions to health problems. Readings that I require will be available online or distributed to you electronically via the Web or Blackboard.

You will need to use the NU library system to find additional material related to your current design charrette solution.

Are any additional learning materials required?

No. There is no textbook. Other than the readings you find on your own, all materials will be made available online.

Are there any common misconceptions about this course?

What you are going to get out of this course is going to be proportional to the effort you put in. If you attack each design charrette, inspired by the challenge of developing a truly compelling idea that others have not thought of before, and if you use the feedback you receive from me and the class to learn how to improve your idea and justify the case for it scientifically, you will end up

with four terrific ideas you can talk about when you describe interesting things you have worked on in school. You may even be inspired to pursue creating one of the ideas!

Technical skills are not required for this course, even though we will be discussing and conceptualizing new technologies in healthcare.

This course is designed for students who are interested in health technology innovation and research. The emphasis on the course is on developing ideation and research skills. This course will *not* teach you particular technical skills like programming.

This course will *not* provide a comprehensive overview of all major topics in personal health informatics, but it *will* get you thinking about how healthcare is changing, and how personal health informatics can play a role.

How will my performance be assessed?

Your grade will be based on the following categories of assignments and weightings:

Assignment	Percentage
Charrette #1 (team)	5% (paper), 3% (presentation and response to critique)
Charrette #2 (team)	10% (paper) 4% (presentation and response to critique)
Charrette #3 (team)	20% (paper) 4% (presentation and response to critique)
Charrette #4 (individual)	35% (paper) 4% (presentation and response to critique)
Peer review critiques	12%
Class participation	3%

How will work be assessed?

Students will be expected to demonstrate self-initiative, creativity, and attention to detail in all work. Prior experience suggests that work will generally fall into one of four categories:

- Superior, striking, or unexpected pieces of work with excellent effort demonstrating a mastery of the subject matter and a skillful use of concepts and/or materials discussed in class; work robustly and fully implemented; work that shows imagination, elegance of presentation, originality, creativity, and effort.

- Good work demonstrating a capacity to use the subject matter and the ability to handle problems encountered in the course.
- Work that is adequate but that would benefit from increased effort or preparation.

Course work falling into these categories correspond roughly to A, B, and C grades.

Papers will be evaluated on clarity, quality of writing, attention to detail, professionalism, and evidence of having done the assigned course reading and a substantial amount of independent research.

Presentations and oral defense of the ideas will be expected to be professional, engaging, and polished, with clarity, good coverage of the topic, and a compelling story that teaches the audience about the idea (as a good TED Talk might do).

All work should aim for a “wow!” factor: Is there a deep dive into an interesting solution to the challenge? Are the ideas justified in research? Is the approach thoughtful? Are the arguments for the work’s significance strong?

How will teams be formed?

Teams in this class will be made up of two or three people. I will assign the teams based on backgrounds and class composition, and the teams will change for each design charrette cycle.

Working in teams can be both rewarding and challenging, and one goal of this course is to give you experience working with different students. It is likely that your teammates will have complementary strengths and weaknesses. If you have concerns about a teammate’s work or teamwork, I want you to talk with me as soon as any issues are identified.

You will be asked to evaluate your team members, as well as other students in the class. These evaluations will factor into your class participation grade assignment.

Can work be turned in late?

Prior to an assignment due date, you may request an extension with a reasonable explanation. It is at my discretion whether to permit late assignments, and I will typically only do so with advanced notice and a very good reason.

If your work is late and the work is not needed for peer review in the subsequent assignment, you can still qualify for all points except ½ letter grade per day missing. That is, if it is two days late, you can receive up to a B. If it is four days late, you can receive up to a C.

There will be no makeup option for in-class assessments/exercises.

Is class attendance required?

Class attendance is required (but see note about pandemic protocols below). *Prior to* a class, if you cannot make it for some reason, please notify me. Unexplained poor attendance will be reflected in your final grade.

Employers or potential employers should be respectful of your need to attend class, especially one that is only once a week. Please arrange for co-op interviews to be scheduled when class is not in session.

Can work be turned in late?

Prior to an assignment due date, you may request an extension with a reasonable explanation. It is at my discretion whether to permit late assignments, and I will typically only do so with advance notice and a very good reason. If an extension has not been granted, late work will be penalized a half a letter grade per day late. Assignments that are required for in-class editing sessions may not be turned in late.

How will the course be impacted by COVID-19 and other illnesses? Will class sessions be recorded?

This course will be entirely in person. Students who are unable to attend class due to illness should contact me as soon as they know, and I will make accommodations.

I will attempt to proactively record most classes on Zoom, but anyone who cannot make a class in person due to illness should check with me in advance about Zoom availability. Students who must be remote are encouraged to leave their cameras on. Due to the nature of the group work we will be doing in class, this will be a difficult class to participate in remotely.

If you are potentially infectious with COVID-19, the flu, RSV, or another serious illness, you should elect to stay home. If you are recovering from illness but you have reason to believe you are not contagious, please be courteous to others and wear a mask just in case.

Are any NU PATH attributes met by this course?

No. This is a graduate-level course.

What should you do if you need a special learning accommodation?

I want everyone in class to feel comfortable learning. If you have a disability you are encouraged to seek accommodations through the University Disability Resource Center. Please speak with me privately about your needs for accommodation and recommended strategies to support your success early in the semester. This information will be kept confidential.

What could you do if you have trouble with writing?

I want the reports and other materials you generate to be professional; i.e., ready for you to show a potential employer without any concern. I will expect high-quality writing.

Assignments that involve writing and presentation will be evaluated based on clarity of presentation and professionalism of presentation, as well as intellectual content. If you are having difficulty with writing, consider using the services of the Northeastern University Writing Center (<https://cssh.northeastern.edu/writing/the-writing-center/>).

What are the additional classroom policies?

Actively engaging in verbal exchanges of ideas and concepts will be a major component of learning in this course. This will be stimulated by readings, class discussions, and problem solving. You will be expected to actively and positively listen to others and to communicate your ideas during class (both in person and virtually). You will be expected to read course materials prior to class, and you will be called upon at times even when you do not raise your hand. Strong participation does not result from talking a lot, but as a result of critical thinking and succinct articulation of ideas that demonstrate you have done the assigned reading (and thinking!).

If you want to record class, please ask me first (per University policy).

Avoid using cell phones in class, which can prevent you and others from learning. In case of emergency, please take your phone outside. Similarly, avoid using your laptop computer for anything other than taking notes, working directly on classwork, or virtual interactions. Any other use is distracting not only for you, but for others in the class.

What are the policies on academic honesty?

You will be expected to demonstrate qualities of academic integrity: a commitment, even in the face of adversity, to five fundamental values: honesty, trust, fairness, respect and responsibility.

You will be expected and encouraged to discuss the topics raised by this course with other students. I will expect, however, that ideas incorporated from an outside source or another student be documented appropriately in write-ups or presentations.

You will be held to the NU Code of Student Conduct (<http://www.northeastern.edu/osccr/code-of-student-conduct/>) and Academic Integrity Policy (<http://www.northeastern.edu/osccr/academic-integrity-policy/>). Acts of academic dishonesty will be referred to the Office of Student Conduct and Conflict Resolution (OSCCR).

Academic honesty is fundamental to the learning process, and I have absolutely **no tolerance** for academic dishonesty. As a reminder,

- You are expected to present as your own work that is actually yours.

- Purchasing term papers from commercial firms or individuals is a serious violation of University policy. Offenders are subject to disciplinary action (Office of Judicial Affairs). (Undergraduate and Graduate Student Handbook, 2000-2001, p.108)
- As a member of the academic community, if you witness an act of academic dishonesty, you are obligated to report it to the appropriate faculty member or department chair (or equivalent). The charge will be investigated, and if sufficient evidence is presented, the case will be referred to the Northeastern University Student Judicial Hearing Board.
- Plagiarizing includes: representing someone else's work as your own, insufficient acknowledgement, and receiving or giving unauthorized help on choosing a topic, analyzing data, or drawing conclusions. **Using the same paper or portions of a paper for two courses without explicit permission from professors of both courses is also unacceptable.**

Any student found cheating on assignments will receive a zero on that assignment and be reported to the administration of the student's college and OSCCR. A second offense will result in a failing grade for the course.

If you ever have questions about what is acceptable or unacceptable collaboration on assignments, please ask me for clarification.

What is Title IX?

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, etc. If you or someone you know has been harassed or assaulted, you can find the appropriate resources here:

[Northeastern and Title IX](#).

Why will I be asked to evaluate this course?

I may distribute optional mid-term and final course evaluations, to be returned anonymously. Responses to the questions help me to improve this course for you, during the current semester, and for future students. I modify courses every time I teach them based on the most recent student feedback I receive.

You will also be strongly encouraged to use the TRACE (Teacher Rating and Course Evaluation) system near the end of the course to evaluate this course. A reminder about TRACE should arrive via email about two weeks before the end of the course. Your constructive feedback will help me and other instructors improve the course in the future.

Do you have other questions or concerns about the course?

If you have questions about the course not addressed by this syllabus, you are welcome to enter your question with a Google Note here and I will answer it and update the syllabus.

I want this course to be a great experience for you

Please don't hesitate to reach out if there are ways I can make the course more effective during the term. **I welcome your feedback, and I very much look forward to teaching you and learning from you!**