ARTG 5640
Prototyping for Experience Design
4 credit hours
junior, senior, or graduate standing

course description
explores tools, technologies and processes to create prototypes of artifacts, environments, interactive systems and similar for experience design projects. This course offers students the opportunity to learn, use, experiment with, and test prototypes using a wide range of state-of-the-art prototyping technologies to further their understanding of multiple strategies and techniques of prototyping for experience design. Tools and techniques change over time but typically include laser cutting, 3D printing, CNC machining, electronics prototyping, augmented reality, machine tools and 2D forming, fast prototyping and hand tools.

learning outcomes
- learners should be able to understand and implement a prototyping process using different tools and methods
- learners should be able to design and create prototypes based on research methods appropriate to experience design
- learners should be able to use fabrication, electronics, and augmented reality to create iterative experience prototypes

course structure
this course meets two times a week. On the first course meeting of the week we will meet in a classroom space for discussions, lectures, and critique. On the second course meeting of the week will be mostly open work time and demonstrations with tools/materials in the studio space. Students will be expected to synthesize prototypes based in spaces and situations to create experiences and interactions. Most of the prototypes will be completed solo but some situations may call for teams. Upon completion of prototype assignments testing will be performed to gather data on the experience and then critique sessions will give targeted feedback on how future iterations of the prototypes could be improved.

assessments
due to the nature of prototyping assessment in this class is based on three factors: effort, adherence to process, and quality of outcome. Taking risks is encouraged and the prototype assignments are designed to be low-stakes to allow for broad experimentation.

Prototypes will have specific rubrics to specify the weights for each of the three factors, but a generalized version is below:

Factor	A	B	C	D	F
Effort	Exceeded expectations of effort outlined in the design specification	Slightly exceeded effort	Fulfilled expectations of effort	Showed a slight lack of effort or direction	Showed a significant lack of effort or direction
Adherence to Process	Process is well documented and obvious based on other factors	Process was followed with few deviations or compromises	Minimal evidence of process	Incoherent process that negatively impacted other factors	No evidence of process
Quality of outcome	Prototype shows real skill in the tools and methods and exceeds design specification requirements	Prototype has only minor flaws and fulfills all design specification requirements	Prototype has flaws and/or does not fulfill all design specification requirements	Prototype is the minimum to be functional	Prototype either fails to work or is inappropriate for the assignment

Documentation is required for each phase to allow students the opportunity to reflect on their work and explain how future iterations of a prototype could be improved to better the experience.

Participation is a very important part of this course as students will need to help each other test prototypes as well as give critical feedback during the creation and implementation of the prototypes. Both level of engagement and quality of participation will be weighted in assessment.

grading rubric

Fabrication Prototypes: 25%
> Fast Prototype: 5%
> Hand Tool Prototype: 10%
> Digital Fabrication Prototype: 10%

Electronics Prototypes: 25%
> Tutorial Prototype: 5%
> Sensor Prototype: 10%
> Interactive Prototype: 10%

Augmented Reality Prototypes: 25%
> Glyph Prototype: 10%
> Space Mapping Prototype: 15%

Reading Quizzes: 10%

Participation: 15%
> Critique: 10%
> Class Activities: 5%

schedule

wk	topics	activities
1	Course introduction and Prototyping process	
2	Research methods for prototyping Quick prototyping and ideation Foam, Clay, Cardboard, etc.	Reading discussion
3	Fabrication: hand tools and wood shop 1	In the Maker Studio
4	Fabrication: Machine tools and wood shop 2	In the Maker Studio
5	Fabrication: Laser Cutting	Wood project
6	Fabrication: 3D Printing and CNC Mold making Vacuum forming	Laser cutting project Fabrication documentation
7	Electronics: Output	Reading discussion
8	Electronics: Input	3D Printing project
9	Electronics: Communication	Electronics 1 project
10	Electronics: Interface/Applications	Reading discussion Electronics documentation
11	Augmented Reality: Basics	Electronics 2 project
12	Augmented Reality: Glyph based	Reading discussion
13	Augmented Reality: Space mapping	AR 1 project
14	Augmented Reality: Interactions	Reading discussion Augmented reality documentation
final	Final critique and debrief	AR 2 project

reading list

throughout the course students will be expected to read articles as well as access references for further information on course topics. They are structured into the different phases of the course: prototyping process, fabrication, electronics, and augmented reality. All readings are either free to access or will be provided as a PDF.

prototyping process

http://www.designkit.org/methods/26

https://www.ideo.com/blog/why-you-should-start-prototyping-right-now

http://www.slate.com/blogs/the_eye/2013/10/23/the_importance_of_prototyping_creative_confidence_by_tom_and_david_kelley.html

http://cba.mit.edu/docs/papers/12.09.FA.pdf

fabrication

The Industrial Design Reference & Specification Book: Everything Industrial Designers Need to Know Every Day Chapter 3 Manufacturing and Chapter 4 Material Selection

https://learn.adafruit.com/laser-cut-enclosure-design?view=all

https://formlabs.com/media/upload/formlabs-design-guide.pdf

https://www.autodesk.com/products/fusion-360/

Prototyping and Modelmaking for Product Design Chapter 2 How Prototypes are Used and Chapter 8 Tools

electronics

https://www.arduino.cc/

Practical Electronics for Inventors, Third Edition Chapter 2 Theory

https://learn.sparkfun.com/tutorials/sik-experiment-guide-for-arduino---v33

augmented reality

https://unity3d.com/

https://www.forbes.com/sites/tiriasresearch/2016/03/28/beginners-guide-to-ar-and-vr/#1e5cb6fc33c1

required books and supplies

There is no required book for the course although book recommendations on specific topics, tools, or methods can be given to any interested student. Students are expected to provide most of their own raw materials for projects. Students may also acquire their own tools throughout the course but tools will be available during work times.

Attendance

Attendance will impact your grade. Only one absence will be excused (if you plan to miss a class, let me know in advance). A second absence will result in your participation grade being cut in half. A third absence will result in a grade of F for the class. University attendance policy can be found here: http://catalog.northeastern.edu/undergraduate/academic-policies-procedures/attendance-requirements/

Absences

In cases of absence, instructor will ask students to provide documentation that the class absence is warranted. Note that University Health and Counseling Service does not provide sick notes or medical excuses except for long-term illness. According to Northeastern's Academic Integrity Policy, documentation of short-term illness can be drafted and signed by the student. Students should understand that their course instructors can file a complaint against them with

OSCCR if they submit false documentation of illness. If classes are cancelled due to emergency, such as the weather, instructor will schedule 1:1 meetings to make up for the class.

University and College Policies

Academic Integrity

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University. The following is a broad overview, but not an all-encompassing definition, of what constitutes a violation of academic integrity:

· Cheating – using or attempting to use unauthorized materials, information, or study aids in any academic exercise

· Fabrication – falsification, misrepresentation, or invention of any information, data, or citation in an academic exercise

· Plagiarism – using as one's own the words, ideas, data, code, or other original academic material of another without providing proper citation or attribution

· Unauthorized collaboration – instances when students submit individual academic works that are substantially similar to one another. While several students may have the same source material, any analysis, interpretation, or reporting of data required by an assignment must be each individual's independent work unless the instructor has explicitly granted permission for group work.

· Participation in academically dishonest activities – any action taken by a student with the intention of gaining an unfair advantage over other students

· Facilitating academic dishonesty – intentionally or knowingly helping or contributing to the violation of any provision of the University Academic Integrity Policy

Review the full policy and additional information online:

http://www.northeastern.edu/osccr/academic-integrity-policy/

expectations for outside of class study

Course credit hours (semester hours) are assigned to a course based on the established national educational standard that one credit hour is equal to approximately three hours of student learning time per week over a period of a semester.

http://catalog.northeastern.edu/undergraduate/academic-policies-procedures/course-credit-guidelines/

Students with Disabilities

Students who have disabilities may wish to consult the Disability Resource Center (http://www.northeastern.edu/drc/getting-started-with-the-drc) for aid with resources and accommodation. Those who wish to receive academic services and accommodations must present the accommodation letters from the DRC to their instructors at the beginning of the semester so that accommodations can be arranged in a timely manner.

Writing Center

The Northeastern University Writing Center–part of the Writing Program and Department of English in the College of Social Sciences and Humanities–is open to students, staff, faculty, and alumni of Northeastern and exists to help writers at any level, and from any academic discipline, in their written communication.
http://northeastern.edu/writingcenter/

Tutoring

The Peer Tutoring Program offers FREE peer tutoring services open to NU undergraduate students actively enrolled in courses where they are seeking academic assistance.
https://undergraduate.northeastern.edu/peer-tutoring/

Language support for non-native English speakers

Global Student Success (GSS) supports the success of international students at Northeastern University. We offer services to students, faculty, and staff.
http://www.cps.neu.edu/student-resources/gss/
While the Global Student Success office is housed under CPS, its services are available to all students.