

Instructor

Lauren K. Stewart, Ph.D., P.E.

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Office Hours: Bluejeans T 9:30-10 am, <https://gatech.bluejeans.com/619075366> or by appointment

Guest Lecturers

Robert Simon, Ph.D.

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DesignBloc: Wayne Li, Ph.D.

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Teaching Assistant

Leyi Wang

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Course Description

This class acquaints the student with state-of-art concepts in origami engineering and teaches the algorithms necessary to design and analyze origami structures for innovative applications. Through the art of origami, students will be introduced to the basic concepts of the design thinking process and will learn to approach innovation from a human-centered perspective. Combining design and engineering, students will develop origami products by adopting the process of reframing problems in human-centric ways, creating ideas through brainstorming, prototyping, and testing.

Part of the Global Engineering Leadership Minor, this course capitalizes on the design thinking approaches taught and links them to the leadership skills of empathy, giving/receiving feedback, learning from failure, and storytelling.

Course Outcomes

During this course, the student will learn by actively participating in lectures and demonstrations, by solving individual homework assignments, and completing a semester-long project as a member of a small team. After the student completes the course they will be able to:

- Identify, analyze, and create origami patterns and structures.
- Mathematically determine key features of origami patterns including deployability and flat-foldability.
- Understand the basic mechanics of origami structures.
- Utilize the design thinking process to understand human-centered problems and develop innovative origami solutions.
- Apply aspects of design thinking to individual and team awareness.

Prerequisites

This course is intended for all levels of undergraduate students who have taken Math 1552 and Math 1553.

Website

The website for the course is <https://canvas.gatech.edu>. Students are expected to check regularly for announcements and are responsible for the material posted. Emails will be sent via Canvas to the email on record. It is the student's responsibility to check their email regularly.

Participation and Attendance

Attendance and punctuality are basic requirements for an effective discussion and team-based course. Therefore, each student's frequency and quality of contribution to the class discussion will be assessed and reflected in the class participation score. If you cannot attend a class, it is a courtesy to inform your group and your professor in advance, if possible. Participation counts for 5% of the final grade. It includes but is not limited to in-class activities, in-class participation, and in-class attendance.

I will honor any Georgia Tech-approved absence. Please let me know as soon as possible if you have an approved absence so that we may make alternate arrangements for the classes that are missed.

Homework Sets

Homework set will be assigned and are to be completed throughout the semester. Collaboration on homework is encouraged. However, you should think about the problems yourself before discussing them with others. Furthermore, you must write up your solutions by yourself and understand anything that you hand in. If you do collaborate, you must acknowledge your collaborators in your write-up. Cheating off of anyone's work including using assignments from previous years is a direct violation of the GT Academic Honor Code, and will be dealt with accordingly per Georgia Tech policy.

Exam

One exam will be given during class on 12/2. The exam will be closed-book and closed-notes. Cheating off of another student's exam is unethical and unacceptable. Other examples of cheating include, but are not limited to, using unauthorized material to exam, collaborating or sharing notes, talking during exam and using cellphones.

Project

Students will participate in a semester-long group project. In this project, students will learn and utilize the design thinking process to develop an origami product.

Grading

The final grade will be determined from the following grading scheme:

- Participation (5%)
- Homeworks (30%)
- Exam (25%)
- Project (40%)

Textbooks

J. O'Rourke (2011). How to Fold It. Cambridge University Press.

M. Lewrick, P. Link, and L. Leifer (2020). The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable Innovation Methods. Wiley.

Course Conduct

The Georgia Tech Honor Code is the standard of conduct for this course. The Honor Code is available at <http://www.honor.gatech.edu/>.

Health

Please do not come to lecture if you are ill and please use good judgment about coming to class if you have been around someone with COVID symptoms. I will make every reasonable effort to allow for makeups/extensions for students who are quarantined and/or ill.

Accommodations for Students with Disabilities

The Georgia Institute of Technology has policies regarding disability accommodation, which are administered through The Office of Disability Services. <http://disabilityservices.gatech.edu/>. For students with disabilities, please contact this Office to request classroom accommodations. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

It is the student's responsibility to coordinate their accommodations with me after ODS has provided the documentation. Specifically, please coordinate exam and assignments at least one week in advance.

Diversity Statement

I consider the class environment to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability - and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Safe Zone Statement

I am a member of a Safe Zone Ally community network, and I am available to listen and support you in a safe and confidential manner. As a Safe Zone Ally, I can help you connect with resources on campus to address problems you may face that interfere with your academic and social success on campus as it relates to issues surrounding sexual orientation and gender identity. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records.

Tentative Schedule

Week	Date	Topic	Due
1	T 8/24 Th 8/26	OE01: Faculty and Course Introduction Folding Activities OE02: Rigid Origami Team Formation Introduction	HW1: Folding
2	T 8/31 Th 9/2	<i>Introduction to User Needs</i> User Activity OE03: Origami Developability Team Formation Activity	HW2: Self-Profile
3	T 9/7 Th 9/9	<i>Introduction to the Design Process</i> OE04: Flat-foldability Printer Training	HW3: Drawing Patterns
4	T 9/14 Th 9/16	<i>Introduction to Empathy</i> OE04: Flat-foldability (continued)	
5	T 9/21 Th 9/23	OE05: Miura-Ori OE05: Miura-Ori (continued) Empathy in Leadership	HW4: Origami Principles
6	T 9/28 Th 9/31	OE06: Egg Box <i>Design Abstraction</i>	Project: Journey Mapping
7	T 10/5 Th 10/7	OE07: Origami Tubes Giving and Receiving Feedback Project Presentations	Project: User Needs Presentation
8	T 10/12 Th 10/14	Fall Break <i>Improv and Brainstorming</i>	HW5: Miura Ori and Egg Box
9	T 10/19 Th 10/21	OE08: Non-rigid Origami OE09: Kresling Pattern <i>Rapid Iteration and Prototyping</i>	
10	T 10/26 Th 10/28	OE10: Bar and Hinge Models OE11: MERLIN	HW6: Origami Tubes
11	T 11/2 Th 11/4	<i>Delivery Through Storytelling</i> OE12: Pop-Up Origami	Project: Initial Prototype Round
12	T 11/9 Th 11/11	OE13: Fold and One-cut <i>Design Critiques</i>	Project: Prototype Updates
13	T 11/16 Th 11/18	OE13: Fold and One-cut (continued) <i>Design Critiques</i>	Project: Prototype Updates
14	T 11/23 Th 11/25	Exam Review Thanksgiving	HW7: Fold and One-cut
15	T 11/30 Th 12/2	<i>Design Critiques</i> Exam	Project: Prototype Updates
16	T 12/7	<i>Design Critiques</i>	Project: Prototype Updates
	Final	Origami Trade Show	Project: Final Report Project: Poster