EID 103A&B: Principles of Design

Spring 2025

Thursdays 2-4:50pm

Room 806, LL210

Instructors: Michael Giglia (michael.giglia@cooper.edu), Douglas Thornhill (douglas.thornhill@cooper.edu)

Office Hours TBD

Course description (from the Cooper Catalog):

This course is designed to introduce students from all disciplines to the concepts of rational design. It is open to first-year students and sophomores. In the first part of the course students will learn by hands-on experience the importance of giving attention at the design stage to consideration of accessibility, repair, replacement, choice of materials, recycling, safety, etc. Students will develop the ability to make observations and record them in suitable form for further analysis of the design process. From this, concepts of 'good' design will be developed, and students will be introduced to the formal design axioms and principles. This will lead to the second part of the course which will consist of a comprehensive, realistic design problem. Creativity, intuition and cultivation of engineering 'common sense' will be fostered within the framework of design principles and axioms. The course will constitute a direct introduction to the disciplines in their interdisciplinary context.

Course Overview:

Homeworks

Assignments will have unique deliverables and due one week from announcement. Generally, they will reflect what was covered in that week's lecture. The homework(s) will be designed to be thoughtful and brief.

Design Journal Weekly Entries
Each week (including lecture weeks) you must have at least a paragraph describing what you learned / did that week. Be sure to talk about successes/failures, foreseeable problems.

Projects

1. Physical Motion Rectifier (PMR) - Students will be given the task of converting a rotational harmonic motion into a non-harmonic, steady motion. This is meant to mimic the behavior of an electrical rectifier which converts alternating to direct current.

2. Automata – Using the fabrication techniques learned in the course, create an original automata, either hand or gravity powered. The footprint of the design must be constrained to a 12-inch cube. Three unique mechanisms must be implemented.

Class goals:

- Use the Engineering Design Process to model and test how designs evolve
- Use OnShape and other collaborative frameworks on your builds
- Learn appropriate design for additive manufacturing principles and apply them to your builds

Tentative class schedule:

Barring any class disruptions, the following table outlines the schedule of the class to the best of the instructors' knowledge.

Date	Section A	Section B
1/23	CAD (806)	Iterative Design (LL210)
1/30	Iterative Design (LL210)	CAD (806)
2/6	Mechanical Advantage and Mechanisms (806)	Design for Rapid Prototyping (LL210)
2/13	Design for Rapid Prototyping (LL210)	Mechanical Advantage and Mechanisms (806)
2/20	Mathematical Analysis of Mechanisms (Rose Auditorium)	Mathematical Analysis of Mechanisms (Rose Auditorium)
2/27	Open working lab	Open working lab
3/6	Open working lab	Open working lab
3/13	Midterm check-in, open working lab	Midterm check-in, open working lab
3/20	Open working lab	Open working lab
3/27	Open working lab	Open working lab
4/3	Check-in	Check-in
4/10	Open working lab	Open working l
4/24	Final Report Draft due	Final Report Draft due
5/1	Open working lab	Open working lab
5/16	Final report due	Final Report Due

Grading scheme: All assignments must be completed for a passing grade. There will be no make-up or extra credit work associated with this course. If you cannot submit an assignment on time, you must contact me before the due date for permission to hand in a late assignment. The standard late penalty is 10% per day, but this may be waived in extenuating circumstances. Students will be graded as follows:

Participation and Conduct	10%
Assignments	15%
Progress Reports / Midterm Presentation	15%
Final Report and Project	35%
Design Journal Weekly Entries	25%

1. **Participation and Conduct:** Students should attend and actively participate in all team meetings. Absences may be excused with advance communication to the instructor. Students with an excused absence must follow up with the team to ensure that they are caught up. Students should ensure that they are contributing to the overall team project. They must treat teammates with respect and act as a good teammate. Peer- and self-evaluations may be used throughout the semester and factor into this grade.
2. **Assignments:** Various homework assignments will be graded for timely completion throughout the course
3. **Progress Reports/Midterm Presentation:** There will be a midterm report or presentation that will present and analyze the current progress of each project. Does the project scope need to be re-evaluated and if so, what adjustments will be made to keep the project goals reachable?
4. **Final Report and Project:** Final report due at the end of the semester will discuss the entire project progress: obstacles faced, sub-problems that arise, solutions to these sub-problems.
5. **Design Journal Weekly Entries**: Each week a journal entry must be documented showing progress and/or pitfalls encountered

Grading scale: Letter grades will be assigned at the end of the semester based on the percentage earned in the course, using this mapping:

90-100	A - superior and comprehensive grasp of the course principles
80-89	B - good degree of familiarity with the course principles
70-79	C - average knowledge of the course principles and fair performance
60-69	D - minimum workable knowledge of the course principles
<60	F - unsatisfactory understanding of the course principles

Academic Honesty: You may not present someone else's work as your own. Work included in your design journal and individual assignments must be your own work. For other work you are encouraged to consult whatever sources are helpful in learning and understanding the issues associated with the material, but you should always provide appropriate references and citations where such material is included in your VIP notebook, programming code, drawings, renderings, presentations, etc.

It is expected that you seek permission to use and acknowledge the use of other team member(s) work.

Additionally, to provide a good working environment for all students, you're expected to adhere to rules given here, posted, or disseminated in class. Academic Honesty is taken seriously and failure to follow these principles will result in disciplinary actions as stated in the Student/Faculty Handbook here.

Course policies, classroom environment, and instructor expectations: We endeavor to create course policies that support a fair and equitable classroom and set high performance standards for all students. We hope to create an inclusive learning environment where you feel both challenged but also constantly respected and recognized within the course. Please make an appointment with any VIP instructor if you are having any issues related to the instructors, the course, or your fellow students.

While we want you to feel comfortable coming to us with issues you may be struggling with or concerns you have, please be aware that we have reporting requirements that are part of our responsibilities as members of the faculty. If you inform any of us of an issue of sexual harassment, sexual assault, or discrimination, we will keep the information as private as we can, but we are required to report the basic facts of the incident to Cooper's Title IX Coordinator. The Cooper Union Title IX policy on sexual misconduct can be found here.

Counseling Services at The Cooper Union are coordinated through the Office of Student Affairs. The Cooper Union counseling and mental health services website can be found here.

Accommodations: Students with disabilities or who need special accommodations for this class are required to notify the Dean of Students and meet with me so that arrangements can be made. Students will not be afforded any special accommodations retroactively, i.e., for academic work completed prior to disclosure of the disability to me and the Dean. Disability support services for students are described here.