

# OIDD 4150/5150, MEAM 4150, IPD 5150

## Product Design

### Fall 2024 Syllabus - Tentative

#### Course Description:

This course provides tools and methods for creating new products. The course is intended for students with a strong career interest in new product development, entrepreneurship, and/or technology development. The course follows an overall product design methodology, including the identification of customer needs, generation of product concepts, prototyping, and design-for-manufacturing. Weekly student assignments are focused on the design of a new product and culminate in the creation of a prototype, which is launched at an end-of-semester public Design Fair. **The course project is a physical good** - but most of the tools and methods apply to services and software products. The course is open to any Penn sophomore, junior, senior or graduate student. The course follows a studio format, in which students meet for three hours each week with Professor Marcovitz for lectures and hands-on making, and students will complete 90 minutes of asynchronous, self-paced content from Professor Ulrich on their own time each week. Professor Ulrich gives one in-person lecture during the semester and attends the Design Fair, but is not present at the weekly studio sessions.

#### Teaching Team:

##### Ashley Marcovitz - Studio Instructor

[productdesignwharton@gmail.com](mailto:productdesignwharton@gmail.com) (preferred email checked regularly by Prof. Marcovitz and TAs)

[ashmarco@wharton.upenn.edu](mailto:ashmarco@wharton.upenn.edu) (personal email for confidential messages)

##### Karl Ulrich - self-paced modules

TAs TBD

Kanika Kumar, grader for all sections

#### Course Format:

Product Design meets for three hours a week for in-person class with Professor Marcovitz. Studio class usually consists of a lecture followed by a hands-on activity, or unstructured work time in the Studios@Venture Lab, our brand-new making facility in Tangen Hall.

Students are expected to complete 1.5 hours of asynchronous content from Professor Ulrich on their own time throughout the week. This content is delivered via Canvas in the form of several short videos, readings, and podcasts. **Professor Ulrich attends the final Design Fair and does one in person lecture for each section, but does not participate in the studio sessions.**

## Goals & Objectives

- Understanding and implementing concepts of design thinking, human-centered design and ideation
- Development and refinement of product concepts, prototypes and pitches
- Introduction to 3D modeling using Rhino
- Introduction to rapid prototyping tools such as laser cutter and 3D printer
- Communication and visualization techniques (sketching and prototyping)
- Introduction to studio model of teaching and working, introduction to concept of group critique and feedback

## Meeting Times and Locations

This is a three-hour in-person course held in Tangen Hall, 115 S. 40th Street (40th and Sansom). Class will begin in room 708 and we will often move to the 1st floor Studios@Venture Lab during class for hands-on work time. Occasionally class will meet directly in the Studios and this will be conveyed before class. The three-hour format allows us to do many hands-on activities using the tools and equipment in Venture Lab. Think of this as the lab component of the course. Some weeks a portion of the time will be unstructured, allowing you to work on your projects.

**Professor Ulrich's weekly content is available for asynchronous viewing/listening on Canvas.** You must view or listen to the lecture material prior to your studio session each week. The weekly lecture content is organized as a Canvas "quiz," with a series of chunks and true/false or multiple-choice questions for each chunk. This format is intended to keep your attention and allow efficient granting of credit for viewing the lectures.

### **Class times - Tangen Hall room 708**

Section 401 - Mondays 12 - 3 PM

Section 402 - Wednesdays 12 - 3 PM

Section 403 - Thursdays 12 - 3 PM

***You must attend the section to which you are registered.***

## Supplies/Software

Students will be provided with a license of Rhino 7 for use during the course. Instructions for accessing the class license of Rhino will be provided on Canvas. The class license can be used for both the Mac and Windows versions of Rhino, but please be aware that the course will be taught using the Windows version. Windows computers with Rhino are available for student use in the Studios@Venture Lab. Students who are less confident with computers may have trouble translating the lessons to the Mac

version, which has a slightly different layout. Such students are advised to use the Windows computers in the Studios for their coursework.

**Required textbook (Kindle/Amazon)** - It is recommended that you rent the ebook version. We are only using limited chapters so the book will not be available at the bookstore.

Ulrich, Eppinger, and Wang. 2019. Product Design and Development. 7th Ed. McGraw-Hill

<https://www.amazon.com/Product-Design-Development-Karl-Ulrich-ebook-dp-B07TC9LZCD/dp/B07TC9LZCD/> (Links to an external site.)

Students should also acquire the following:

- A dedicated unlined sketchbook (any size that feels comfortable to you is great)
- Pencil with eraser
- An external mouse for use with Rhino - it is very difficult to use Rhino on a trackpad and a mouse is essential. If a mouse is not within budget, USB mice will be available during class time but if possible please purchase a mouse for homework use. **A mouse with a scroll wheel is ideal.**
- *Optional:* a 6" digital caliper - a caliper is a highly accurate measuring device we will be using during class. We will have shared calipers for class use but if you enjoy design, owning your own is a great tool. This is a highly recommended model.  
<https://www.amazon.com/Digital-Caliper-Adoric-Calipers-Measuring/dp/B07DFFYCXS/>

## Assignment Deadlines & Late Policy

Most assignments will be due at the start of your studio section each week, including Professor Ulrich's asynchronous content. All assignments have an attached rubric for your reference on how the assignment will be graded.

We will accept late work for most assignments up to 24 hours after the due date/time. Late work will be graded at 25% credit, provided your submission would have merited full points had it been on time. For example, a 1 pt assignment submitted late within 24 hours of the due date would receive 0.25 pts provided that the work was fully complete. Any submissions after 24 hours will not be accepted.

There are several notable exceptions to the late policy. Assignments that are time-sensitive, such as IdeaSpark submissions and pitch slides, cannot be submitted late and are ineligible for 25% credit if submitted late. These assignments require work for our TAs, instructors and your fellow classmates immediately upon their due date/time and therefore cannot be submitted (or edited) late. These assignments are very clearly marked on Canvas and often have an unusual due time - please take note.

Extensions will be considered on a case-by-case basis. Please do not hesitate to reach out if you feel you are falling behind or are having difficulty due to extenuating circumstances.

## Course Overview

Please see the Modules page on Canvas for a highly detailed breakdown of coursework and assignments.

### Pre-Work (asynchronous; to be completed before our first class)

- *Video: Welcome Video from Professor Ulrich (25 min)*
- Assignment: Download Rhino
- Assignment: Rhino Exercises - Intro to Rhino Work Environment video (26 min), Curve Exercise Part 1 video (18 min), OSnaps video (12 min), Curve Exercise Part 2 video (11 min)
- Assignment: Laser Cutting Mini Project
- Assignment: Identify 5 Pain Points (20 min videos plus time for ideation) - identify 5 pain points in your life that you are interested in exploring to use in activity in our first in-person class and submit to Canvas
- *Self-paced module: Introduction to Product Design*

### Class 1 (week of Sept 9)

- **In Studio: Introduction to Emotional Design**
- In Studio: Assemble and review stools
- Assignment: Welcome Survey
- Homework: Rhino Exercises- Scale Tool video (6 min), Curve Exercise Part 3 video (14 min)
- *Self-paced module: Opportunity Identification & the VIDE Model*

### Class 2 (week of Sept 16)

- **In Studio: Basics of Aesthetic Design- What Makes Things Beautiful?**
- Homework: Submit 5 product ideas to IdeaSpark and rate 50 of your classmates' ideas (see unusual deadlines in Canvas)
- Choose one idea and prepare 60-second Opportunity Pitch for next class
- *Self-paced module: Far Horizon Innovation*

### Class 3 (week of September 23)

- **In Studio: Opportunity Pitches**
  - After everyone pitches, the class will vote and the top half of ideas will move forward. Students whose ideas are not moving forward will pair up with a winning idea to move forward as a pair.
- Homework: Get to know your potential customers by conducting more ethnographic interviews and taking photos of a user going through your pain point:
  - Craft a Problem Statement (partner assignment); Conduct an ethnographic interview; Camera journal
- *Self-paced module: Cost, Channel, and Unit Economics*

#### **Class 4 (week of Sept 30)**

- **In Studio: Identifying Insights and User Needs**
- In Studio: Partner Collaboration & Communication Document
- In Studio: Team Customer Needs (Finish for Homework)
- Homework: Collect prototyping supplies for next class
- Homework: Generate 5 concepts with your team around your problem statement
- Homework: Rhino Exercise- Surfaces From Curves video (38 min)
- *Self-paced module: Industrial Design and Crowdfunding*

#### **Class 5 (week of October 7)**

- **In Studio: Proof of Concept Prototype**
- In Studio: One Part Introduction
- Homework: Rhino Exercise- Curves from Surfaces video (12 min)
- Homework: create proof of concept prototype
- Homework: prepare 2-minute Team Concept Pitch for next class with your partner
- *Self-paced module: Careers in Product*

#### **Class 6 (week of October 14)**

- **In Studio: Concept Pitches**
  - After all groups pitch, the class will vote and the top half of ideas will move forward. Pairs whose ideas have not been chosen will join a new group and students will be in these new groups of four for the remainder of the semester
- In Studio: Solid Modeling in Rhino- Design a Candle Holder Exercise (Finish for homework)
- Homework: Rhino Exercises: Naked Edges video (18 min), Primitives and Boolean Operations video (27 min)
- Homework: One Part Sketch, Visualization I sketching exercise, Proof of Concept Prototype user testing (team assignment)
- *Self-paced module: None*

#### **Class 7 (week of October 21)**

- **In Studio: Intro to 3D Printing**
- In Studio: Final Group Collaboration & Communication Document
- Homework: Rhino Exercise- Advanced Rhino Tools video (21 min)
- Homework: Midterm Course Feedback for Teaching Team (Optional)
- *Self-paced module: Global Sourcing*

#### **Class 8 (week of October 28)**

- **In Studio: Professor Ulrich In-Person Lecture + Introduction to Fabrication**
- Homework: One Part Challenge
- Homework: Visualization II sketching exercise, Team Schematic Design, Rhino Contour Command video (23 min, optional)
- *Self-paced module: Patents and Intellectual Property*

#### **Class 9 (week of November 4)**

- **In Studio: Manufacturing Processes and Alpha Prototype Work Day**
- Homework: Visualization III sketching exercise
- Homework: Prepare a 4-minute Alpha Prototype Pitch with your group to present next class
- *Self-Paced Module: Product Management*

#### **Class 10 (week of November 11)**

- **In Studio: Alpha Prototype Pitch**
  - No ideas will be eliminated. This is a litmus test for how well you are doing with your prototype and pitch before the Design Fair.
- In Studio: Group Check Ins with Prof Marcovitz
- Homework: 5 product names (individual assignment), Team Assembly Drawing, Team Cost Model, Graphic Design and Rendering with Rhino video (23 min, Optional)
- *Self-Paced Module: Sustainability and Service Design*

#### **Class 11 (week of November 18)**

- **In Studio: Design Fair Prep Work Day**
- Homework: Team Design Fair Deliverables Assignment, Team Final Prototype, Team Final Name
- *Self-Paced Module: Entrepreneurial Product Development (Optional)*

#### **Thanksgiving (No class Week of November 25)**

#### **Class 12 (Week of December 2nd):**

- **No regularly scheduled class this week! Instead, everyone who does not have another class is expected to attend our final Design Fair - date TBD**
- Homework after the Design Fair:
  - *Self-Paced Module: Wrap Up*
  - Assignment: Final Teamwork Reflection

The Design Fair is a single final event (there is no final exam) for all sections of Product Design, and as such, will occur outside of class time for some sections. If you are unable to attend because you have a conflicting class, we understand and hope that others in your group are able to represent you at the fair. You will not lose points if you are unable to attend.

## **Policies**

### **AI Policy**

In this class, the use of AI is permitted for ideation and concept generation purposes. Students are encouraged to leverage AI tools to brainstorm ideas, explore possibilities, and enhance their creative thinking. However, the use of AI for image generation or sketching is prohibited. The objective is to get comfortable with traditional visualization skills as a means to quickly express ideas. If AI-generated content is incorporated, proper citation and acknowledgment of the AI tools used are mandatory to ensure academic integrity and responsible usage. Students who use AI for sketching, rendering or 3D model generation will be subject to the course academic dishonesty policy, below.

### **Academic Dishonesty**

The instructors of this course take academic dishonesty extremely seriously. Academic dishonesty can encompass any work submitted as your own that you did not totally create yourself. This includes copying others' writing, submitting work from another class without prior instructor approval, sharing the attendance information with those who are not present in class (and vice versa) and downloading CAD models from the internet and submitting them as your own. Depending on the severity of the infraction, general academic dishonesty could result in failure of the course and the initiation of disciplinary proceedings with the university.

Academic dishonesty in the form of presenting CAD work that is not your own will incur a zero on the assignment and the deduction of a full letter grade from your final grade, with the potential for more serious consequences depending on the severity of the infraction, such as the initiation of disciplinary proceedings with the university.

Please see Canvas for a detailed description of grading and other policies, as well as information about office hours for Prof. Marcovitz and the TAs.