SE402 – Computer-Aided Product Realization

Fall Semester 2024

Instructor: Prof. Molly Goldstein 309 Transportation 300-8169 mhg3@illinois.edu

Teaching assistant: Simon Zhang (czhan106@illinois.edu)

Credit: 3 (or 4) credit hours

Meeting Times: Monday/Wednesday 3-4:20 Mostly in 316TB, and with announcement in 207 TB

Prof. Goldstein Office hours and location: Wednesdays 11:30-12:30 309TB and by appointment. Simon and open lab hours will be posted on Canvas.

Preferred method of contact: My preferred method of contact is in-person during office hours or during class. I will also respond to email messages and can set up separate appointment times, but please keep in mind that I make take a full day to respond. Please include SE402 in the subject line of all emails.

Course Description:

In the first half of the course students are introduced to a variety of design tools, including cloud-based, freeform CAD for modeling and design collaboration, 3D printing, 3D scanning and scan data processing, simulation for design engineers, and rendering and animation. Working in teams, students then use these digital prototyping tools to design and prototype a product or device.

Text:

Required book: Creative Confidence: Unleashing the Creative Potential within Us All by Tom Kelley & David Kelley;
All other readings on CAD and design topics are assigned and posted on Canvas

Tools:

Software	**Hardware**
Autodesk Fusion 360	Dimension SST 1200, Elite 3D printers
Creaform VXelements	Creaform portable scanner (structured light)
Geomagic Design X	Collaboration tables (4)
Autodesk ReCap Photo	Newline 80” multi-touch display
Autodesk Netfabb	

Assessment:

Fusion tutorials (FT) ~8	10%
Fusion assignments (FA) ~5	15%
Scan and print tutorials (ST) ~3	5%
Scan and print projects (SP)	15%
Discussion posts	10%
Product design project (DP)	40%
Reading reflections (R)	5%

Course Goals:

1. Expand upon existing CAD skills using parametric and direct solid modeling.
2. Use T-Splines to develop sculpted, watertight geometry.
3. Understand the various capabilities and weaknesses of parametric solid, direct solid, NURBS, and T-Splines modeling.
4. Gain hands-on experience using 3D printing and 3D scanning.
5. Gain experience using digital prototyping tools used for visualization and simulation.
6. Promote multidisciplinary collaboration between engineering and industrial design.
7. Use cloud-based 3D CAD for collaboration.
8. Build creative confidence as a designer.

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Week	Date	Topics	Demo (Training)	Tutorials (Training)	Assignments/Projects	Reflections, Discussion Posts
1	8/26 8/28	CAD & Design What is Design; Intro to DP; Problem Scoping	Fusion	Sketch (FT1) & Solid (FT2)		What is design? (R0)
2	9/2 9/4	Labor Day – No class Design Thinking in Action - Activity			Model (FA1)	
3	9/9 9/11	Assembly Modeling Science of Design; Team assembly and creative acts		Assemble (FT3)	Assembly (FA2)	Science of Design (R1)
4	9/16 9/18	Curves & Surfaces *Team Design Pitches*		Form (FT4)	Assembly (FA2a)	Two Design Paradigms (R2)
5	9/23 9/25	Lab time Concept Generation		Surface (FT5)	Sculpt (FA3)	Engineering Design Thinking (R3)
6	9/30 10/2	Freeform Modeling Model Evaluation & Analysis	Fusion	Drawing (FT6)	Sculpt (FA4)	*Creative Confidence, Ch1*
7	10/7 10/9	Curve Evaluation *Design Review (DR1)*				*Creative Confidence, Ch2*
8	10/14 10/16	Scanner Hardware ½ class Scanner Hardware ½ class	VXelements	Geomagic (ST1)	Scan to Mesh (SP1)	*Creative Confidence, Ch3*
9	10/21 10/23	Scanner Software ½ class Scanner Software ½ class	Geomagic ReCap Photo	Geomagic, ReCap, Fusion (ST2)	Scan to CAD (SP2)	*Creative Confidence, Ch4*
10	10/28 10/30	Lab time - DP Prototyping	Catalyst Netfabb			*Creative Confidence, Ch5*
11	11/4 11/6	Additive Manufacture; Simulation Iterating		Simulation (FT7)	Simulation (FA5)	*Creative Confidence, Ch6*
12	11/11 11/13	Simulation Team time		Generative Design (FT8)		*Creative Confidence, Ch7*

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13	11/18 11/20	Lab time *Design Review (DR2)*				*Creative Confidence, Ch8*
14	11/25	Thanksgiving Break				
15	12/2 12/4	Team time Team time		Render & Animation (FT9)		Informed Design (R4)
16	12/9 12/11	Team time DP Final Presentations				