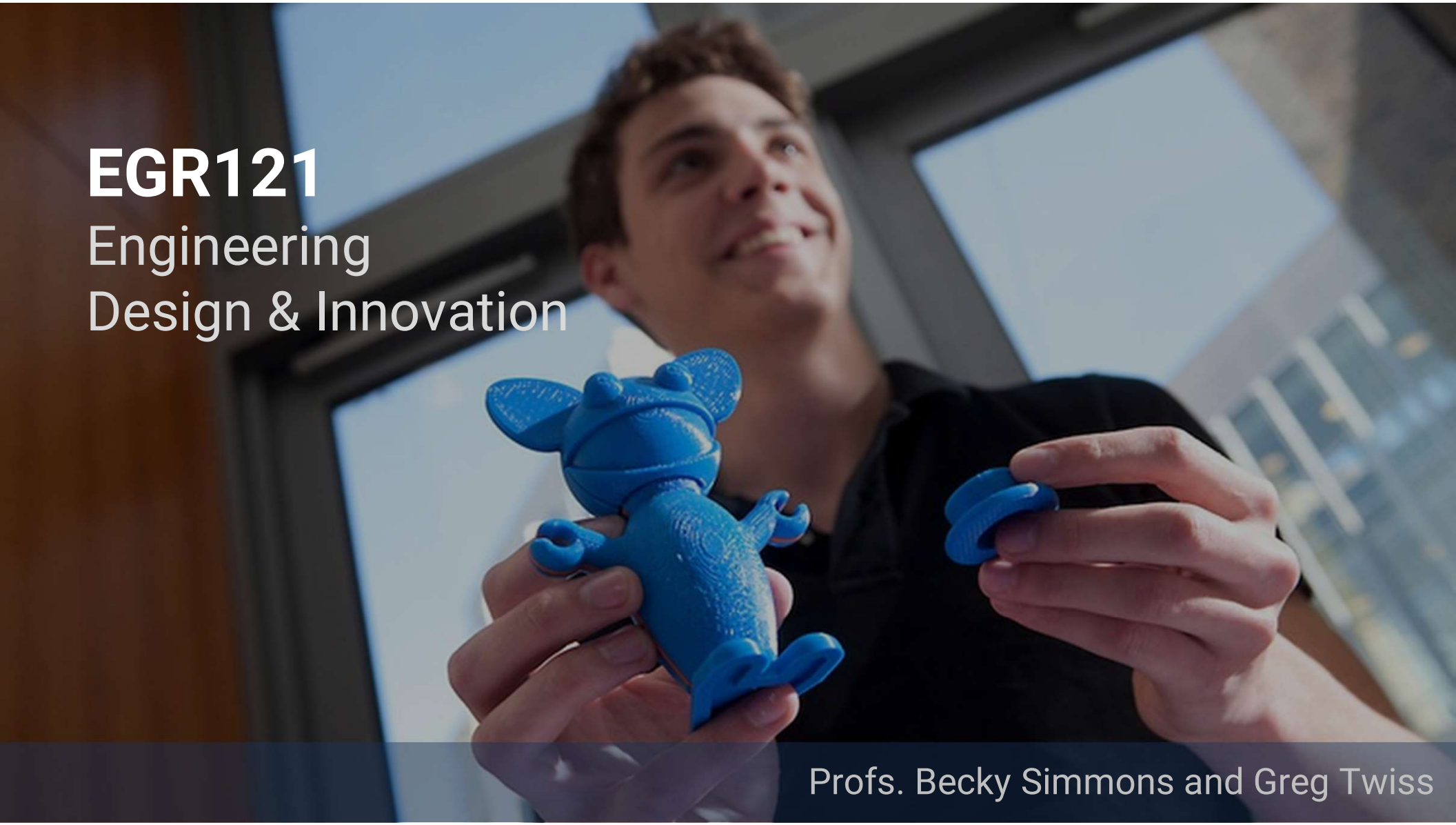


# EGR121

## Engineering Design & Innovation

Profs. Becky Simmons and Greg Twiss

# Course Activities & Outcomes

## Build a Creative Confidence Toolkit

Team Projects
Open-ended
High ownership

Principled Iteration

Multi-domain Experiences and Tools

Learn
Experience
Reflect

## Create, Manage, Build, Test, and Execute Ideas


Ideas
Fluent + Flexible

Rapid Prototyping
Materials + Methods

Validation Tools

## Apply and Synthesize Technology and Tools across Domains

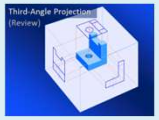
Machining,
Manufacturing
Variation and DFM

Human Factors and Usability

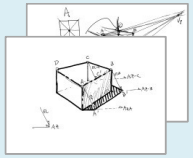
Design, Market,
Manufacture,
and Present

Electro-mechanics

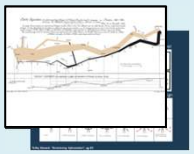
## Visualize and Communicate




Mechanical Visualization



Sketching & Rendering



Data Visualization

MCAD and 3D Printing

# Basic Course Topic Flow

1. **Intro**
   - Innovation
   - Opting “In”
   - Skills Toolkit Metaphor
   - Logistics and Grading
2. **The Engineering Design Process**
   - Managing Intersections
   - Process Models
   - Design influences
3. **Creating and Managing Ideas**
   - Fluent/Flexible
   - Methods
   - Morph. Matrix
   - Idea Selection
4. **MFG Materials and Processes**
   - Mg. processes
   - Plastics
   - Sheetmetal
   - DFM Rules
5. **Needfinding+ User Scenarios**
   - Find the REAL problem
   - Human variat.
   - Characters and Scenarios
6. **Mech Dims and Tolerancing**
   - Conventions
   - Basics of “Fit”
   - Process Tol.
   - Analysis/Stat.
7. **Plastic Parts Design**
   - Inj. Molding
   - Resin Matl’s
   - DFM Rules
   - Design Examples
8. **Human Factors**
   - Definition
   - Tools
   - Techniques
   - Examples
9. **Human Acts and Errors**
   - Usability
   - Affordances, constraints, mapping, feedback
   - Human error
10. **Electronics Fundamentals**
    - History
    - Fundamentals
    - Passive comps
    - Connections
    - Structured build approach
11. **Electronics II**
    - Active comps.
    - 555/339
    - Transistors
    - Motors/Sol.
    - Design / Test Strategies
12. **Electronics III**
    - Circuit Build Examples
    - Integrating power, circuits and outputs
    - Troubleshooting
13. **Information Viz. And Pressent.**
    - Data viz.
    - Case studies
    - Resources
14. **Course Wrap Up**
    - Summary
    - Overview

# Assignment Flow: Design Challenges and Focused Skills

## DCs

### DC1: Machine Anatomy

- Permission to disassemble
- Value Analysis
- Design = Re-design
- Teamwork


### DC2: Machine Design

- Open-ended problems
- Rapid proto process/matl
- Managing ambiguity
- Build-Test-Repeat

### DC3: Happy Meals

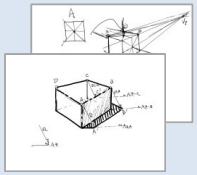
- E-2-E Problem
- Manage design tradeoffs
- Concept > MCAD > Parts
- Devise/present cohesive Mkt to MFG plan

### DC4: Play Ball!/ Rube Goldberg Machine

- Electro-mechanical
- Interactions and handoffs
- Teams of teams

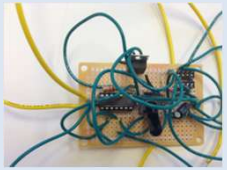
## Focused

**MCAD (Solidworks)**



**Sketching and Visualization**

**Microprocessor Programming Fundamentals**



**Electronics Design-Build-Test**

# Course Calendar

**NOTE: this is the general calendar. Please refer to and rely on individual assignment docs in Canvas for exact Begin/End dates!)**