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GENERAL
ENGINEERING

INTRODUCTION TO PROTOTYPING

SKILLS WORKSHOP 1
EG-UY 1004

AGENDA

1. Logistics
2. Objectives
3. Background Information
4. Materials
5. Activity
6. Assignment



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INTRODUCTIONS

- Meet your Lab and Roaming TAs!
- Introduce yourselves



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WEBSITE REGISTRATION

- Go to eg.poly.edu
- Click on “Sign In” and login with your NYU email
- Enter the appropriate information to register on the site
- Once registered, the lab TA will approve your account



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COMMUNITY AGREEMENT

What do you need to feel safe, comfortable, and excited to learn in lab?

Stay home if you are unwell.

- Your physical, mental, and emotional health come first.

Respect each other.

- Practice inclusive language. Hold space to grow and hold each other accountable. Listen respectfully and with compassion.

Be present and participate.

- Arrive to class on time and open to learn. Contribute positively to your lab group dynamic and workflow.

Share responsibility for including all voices in the conversation.

- Make space for all voices and allow others to volunteer information. Respect others' privacy.

[As a group, add one or more guidelines to agree to uphold this semester and beyond.]

Focus on what is important and relevant to your section specifically.



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RECAP OF EG-UY 1004 LAB

- Lab groups of 2-4 students
- 15 minute lateness policy
- Lab survey at the end of each lab
- Weekly lab report due at 11:59 pm on night before the next lab



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RECAP OF SAFETY GUIDELINES

- Do not eat, drink, or smoke/vape in labs
- Be rested
- Be alert
 - Locate marked exits, fire extinguishers, first aid kits
- Be tidy
 - No horseplay, shouting, or running
- What is one electrical safety measure?
- What is one mechanical safety measure?



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OBJECTIVES

1. **Understand** the concept of a prototype and design thinking process
2. **Identify** rapid prototyping techniques
3. **Practice** ideating prototypes of engineering solutions



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BACKGROUND INFORMATION

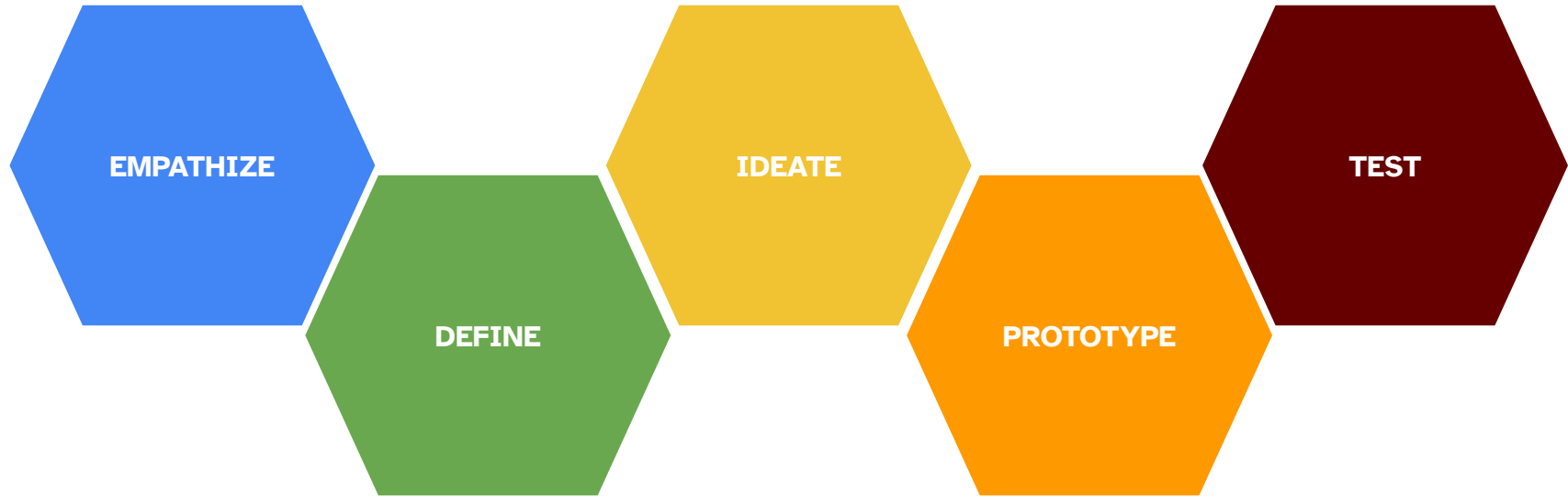


Figure 1. The design thinking process (courtesy of d. school).



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BACKGROUND INFORMATION

Students prototype an engineering solution to a real-world problem

General Engineering Design Challenge

Track 1

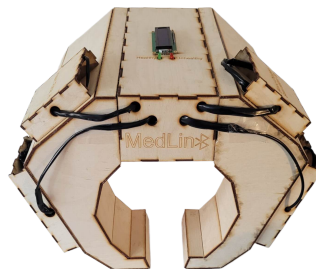
Sustainability

Track 2

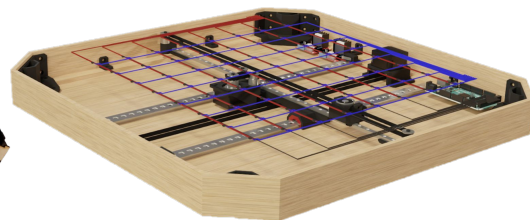
Engineering and Culture

Track 3

Entrepreneurship, Design, & Innovation



MedLink



Robochess



Commuter Clock

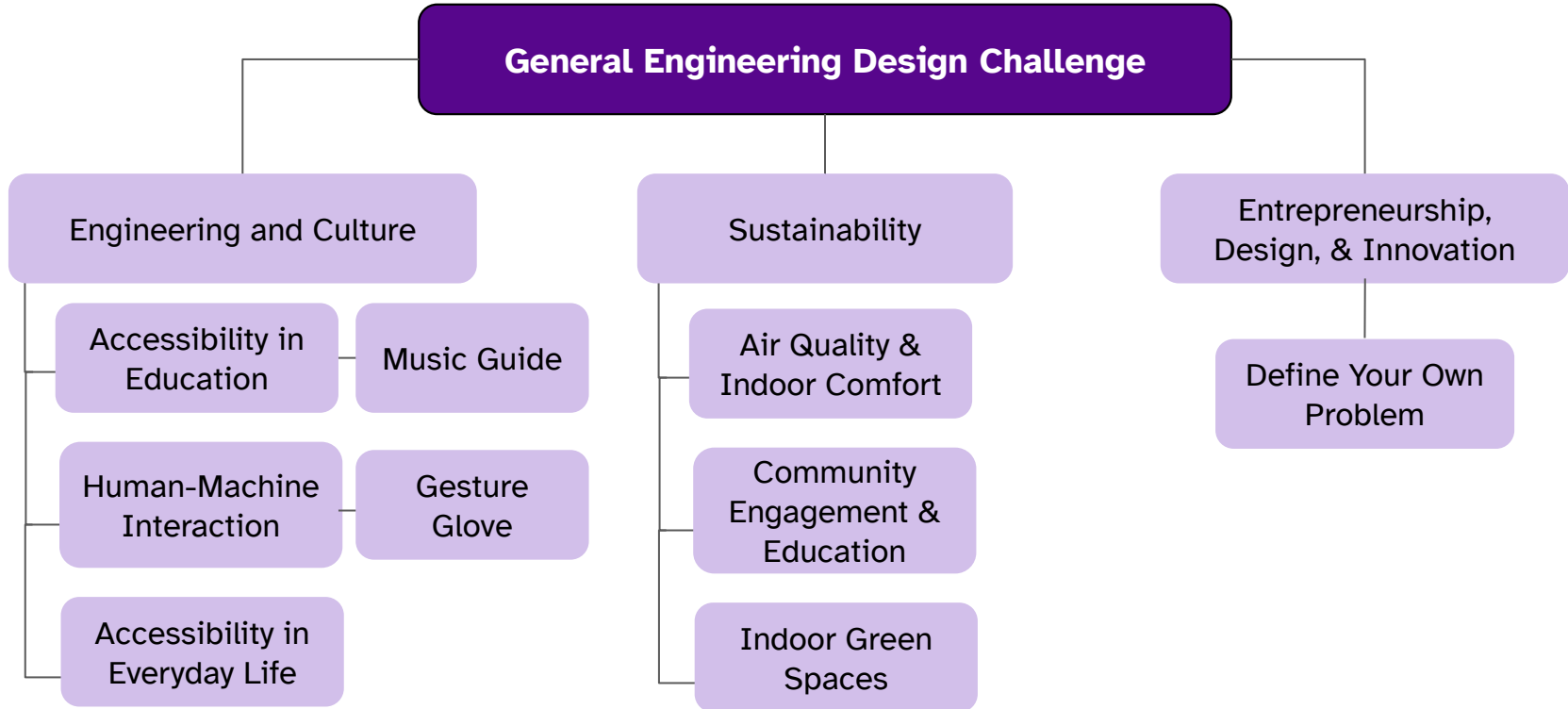


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BACKGROUND INFORMATION



BACKGROUND INFORMATION

A **prototype** is a model that serves an insight into the future of a product or object

Prototyping, the process of making a prototype, is the foundation of the SLDP

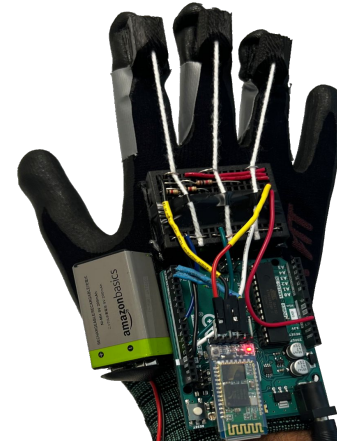


Figure 2. Prototype of a wireless, gesture-based computer mouse.



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BACKGROUND INFORMATION

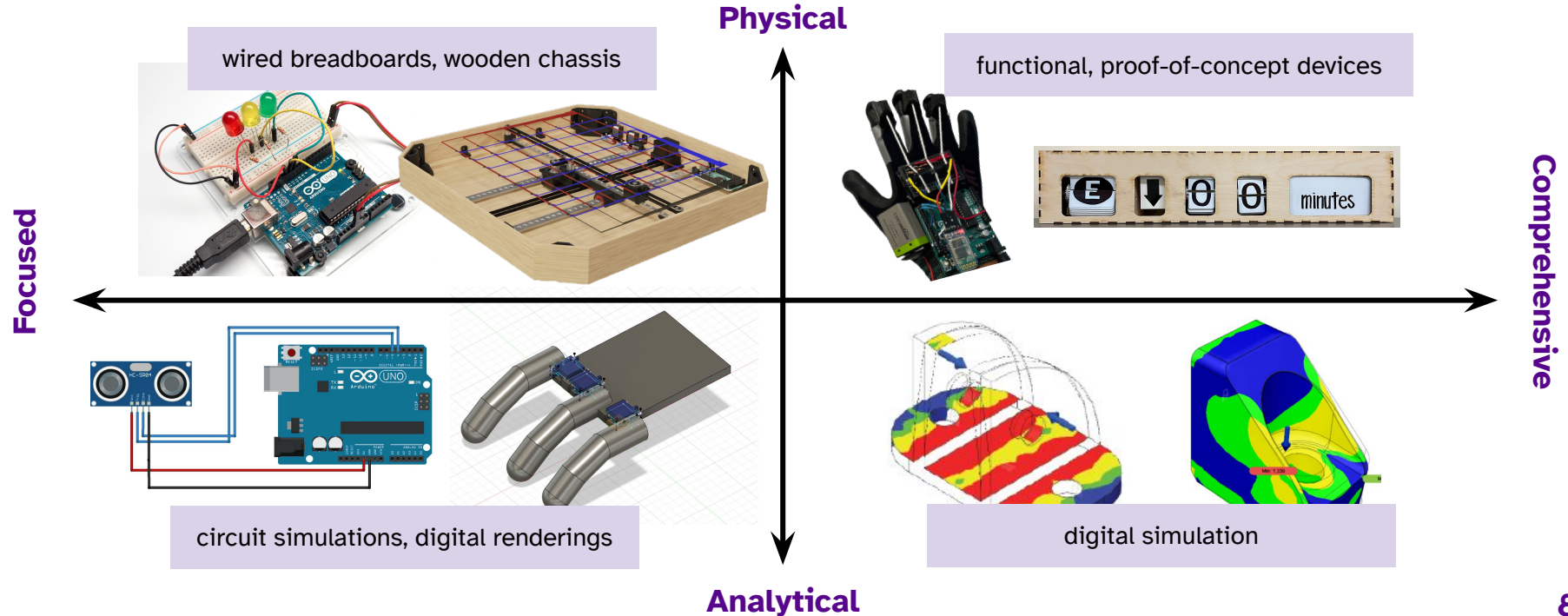


Figure 3. Prototype dimensions (focused versus comprehensive, physical versus analytical).

BACKGROUND INFORMATION

The EG-UY 1004 semester-long design project is an exercise in **rapid prototyping**, using techniques including

- Laser cutting
- 3D printing
- CNC milling
- Circuitry with breadboards and microcontrollers



Figure 4. A digital rendering of an electronic saxophone (left), later assembled and enclosed in 3D printed plastic (right).



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ACTIVITY

Spin the Wheel Ideation Session

1. Form teams of 3-4 students
2. Listen to the TA for the problem to solve and required components
3. Take 10 minutes to discuss a solution among teammates
4. Prepare a 2 minute presentation for the class

Presentation Questions:

1. Describe what a focused, analytical prototype of the product would be.
2. Describe what the comprehensive, physical version of the prototype would be.
3. Define the function of each of the sensors in the prototype, and how the sensors work together.
4. Propose a method (for example, 3D printing) to fabricate the prototype.



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ACTIVITY

Light Sensor

Function	Measures light intensity
Output	Analog or digital signal proportional to light intensity
Example Application	Adjust indoor lighting based on ambient light



Figure 5. Light Sensor, image courtesy of Amazon.



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ACTIVITY

Buzzer

Function	Produces sound when electrical signal is applied
Output	Audible tone or beep
Example Application	Sound an alarm for a timer



Figure 6. Adafruit 1739 buzzer, image courtesy of DigiKey.



ACTIVITY

Fluid Pump

Function	Moves fluids from one place to another
Output	Controlled flow of liquid
Example Application	Control fluid delivery in medical treatments



Figure 7. Fluid Pump, Image courtesy of DigiKey



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ACTIVITY

LCD Screen

Function	Displays alphanumeric characters on a 16-column by 2-row screen
Output	Visual display of text and simple graphics
Example Application	Display time and date

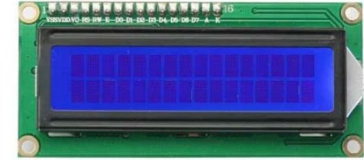


Figure 8. LCD Screen, Image courtesy of Arduino



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ACTIVITY

Force Sensor

Function	Measures force applied
Output	Resistance corresponding to the force applied
Example Application	Touch-sensitive control



Figure 9. Adafruit 5475 force sensor, image courtesy of SparkFun.



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ACTIVITY

Joystick Module

Function	Provides directional control input
Output	X and Y axis positions
Example Application	Control a robotic arm



Figure 10. DEVMO joystick module, image courtesy of Amazon.



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ACTIVITY

Ultrasonic Sensor

Function	Measures distance using ultrasonic waves
Output	Distance measurement based on echo time
Example Application	Detect the presence of an object



Figure 12. Adafruit HC-SR04 Ultrasonic Sensor, image courtesy of SparkFun.



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ACTIVITY

Bluetooth Module

Function	Enables wireless communication between devices
Output	Wireless data transfer
Example Application	Operate devices remotely

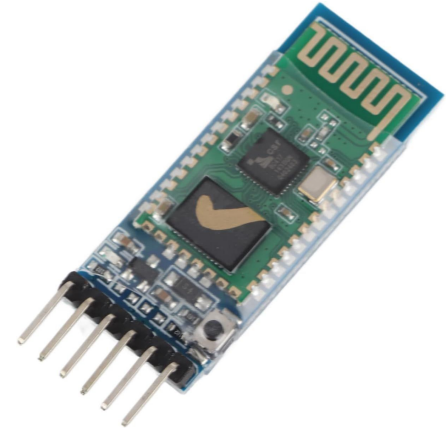


Figure 13. HC05 Bluetooth PLS CHANGE Module, image courtesy of Amazon.



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ACTIVITY

CO₂ Sensor

Function	Measure CO ₂ concentration
Output	Analog signal proportional to CO ₂ levels
Example Application	Adjust ventilation systems based on CO ₂ levels



Figure 14. MQ135 gas sensor, image courtesy of Digikey.



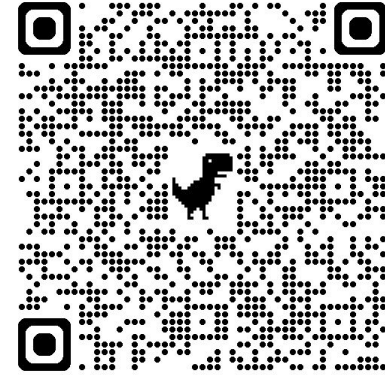
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MATERIALS

1. Writing utensil
2. Sheet of paper
3. Optional: to view a table of the required components, scan the QR code on this slide and scroll to Appendix A



**SCAN TO VIEW
APPENDIX A**



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ACTIVITY

Problem 1

A friend shares that they are having difficulty with distractions as they adjust to life in their dorm.

Provide a solution that helps them focus in crowded, communal areas.

1. Describe what a focused, analytical prototype of the product would be.
2. Describe what a comprehensive, physical version of the prototype would be.
3. Define the function of each of the sensors in the prototype, and how the sensors work together.
4. Propose a method (for example, 3D printing) to fabricate the prototype.



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ACTIVITY

Problem 2

NYU Dining Services would like student input on how to reduce students' food waste in Jasper Kane.

Provide a solution that measures waste and educates students about their habits in the dining hall.

1. Describe what a focused, analytical prototype of the product would be.
2. Describe what a comprehensive, physical version of the prototype would be.
3. Define the function of each of the sensors in the prototype, and how the sensors work together.
4. Propose a method (for example, 3D printing) to fabricate the prototype.



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ACTIVITY

Problem 3

Identify a problem as a team and propose an engineering solution.

1. Describe what a focused, analytical prototype of the product would be.
2. Describe what a comprehensive, physical version of the prototype would be.
3. Define the function of each of the sensors in the prototype, and how the sensors work together.
4. Propose a method (for example, 3D printing) to fabricate the prototype.



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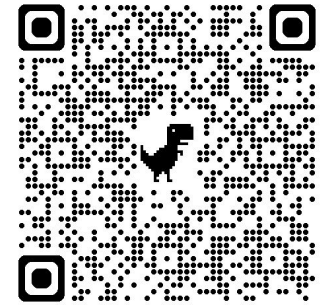
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ASSIGNMENT

SLDP Ideation Assignment – due the night before Skills Workshop 2

1. Read the lab manual pages related to the SLDP
2. Reflect on each of the project tracks
3. Brainstorm project ideas
4. Download the ideation assignment template
5. Respond to the prompts in the template
6. Upload the completed doc to the EG website



**SCAN TO VIEW
TEMPLATE**



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Questions?



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