INDUSTRIAL SOLUTIONS LABORATORY

Company Information

Company Name	*Discovery Place Science Center*	**Date Submitted**	*11/23/2022*
Project Title	*Design and Build of a 21st Century Rube Goldberg Device* ***(DP_RUBE)***	**Planned Starting Semester**	*Spring 2023*

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical	4	Electrical	1
Computer	1	Systems	

Company and Project Overview:

Discovery Place is a 501c3 nonprofit and a hub for science education and exploration in the Carolinas with four distinct museum experiences serving more than 750,000 people a year through Museum visits, interactive educational programming and community outreach initiatives. We aspire to shape a future where people embrace science to create opportunities, build hope, solve problems and bring positive change for our world.

This project is financially supported by the Bosch Community Fund. The Bosch Community Fund, the corporate foundation for Bosch in North America was established in 2011 to provide community engagement and philanthropic support on behalf of our company. The Fund focuses on the enrichment of science, technology, engineering and math (STEM) education and advancing environmental sustainability initiatives. We partner with 501(c)(3) organizations and educational institutions across the country to provide quality project-based learning hands-on learning opportunities for students and professional development for teachers.

We are interested in the fabrication of an exhibit that would take the classic form and function of a Rube Goldberg device, bring it to life for our science center audience and add some 21st century flair to the experience. The drama, surprise, and whimsy of a Rube Goldberg device can delight people of all ages, even as it shows off the fundamentals of mechanics and the concept of the inputs and outputs of a system. Although it is a classic science center exhibit, we want the team to consider how the model can also be updated to the 21st century – maybe it includes an augmented reality component, a smart speaker, or a motion sensor that requires the input of a guest dancing, or it features a musical clip from a current artist, or a robotic vacuum cleaner, or another aspect that is recognizably an update to the classic model. Given Discovery Place's emphasis on interactive, hands-on learning, we would also like the guest to be able to provide input into the system in some way.

Project Requirements:

What began as a series of cartoons by Rube Goldberg, these fun chain-reaction systems became a 20th century phenomenon. Showing up in films, science museums, and commercials, it became a fun building challenge that showcased simple machines, the idea of closed systems, if/then statements and more.

The objective is to bring the concept into the 21st century. Many of the concepts it featured or was based on are still germane to engineering today, but when they are built, they often feel like it truly comes from the last century. What would it look like if this idea had first come about in 2022, instead of 1929?

The project team will design and produce an exhibit that is a closed system chain reaction, inspired by Rube Goldberg devices. The exhibit should be no larger than 10'x5' and include at least ten components from beginning to end. Although these devices are traditionally linear, an exploration of a nonlinear approach may also be considered, as long as the overall system stays true to the Rube Goldberg concept of a closed system composed of chain reactions that have a clear start and end.

Expected Deliverables/Results:

At the end of the project, the team is to provide Discovery Place with:

- A functional exhibit that can be installed for guests. The exhibit should include:
    - A stand or pedestal for placing the exhibit at the appropriate height
    - Casing or enclosure to ensure that guests are only able to interact with the mechanisms in a manner in line with the correct functioning, and not a destructive manner.
    - A relatively robust build, with materials and mechanisms that will be able to withstand heavy usage by tens of thousands of people.

    - The exhibit should be able to reset itself and not require staff monitoring to function properly.
    - Recognition of the financial support from the Bosch Community Fund.
- A manual for basic repairs, maintenance, and troubleshooting
- Training for the exhibit team on the nuances of the exhibit

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- Millwork or woodworking
- Mechanical engineering
- Computer programming
- Electrical wiring
- Creative thinking