Coding

The COVID-19 pandemic has been tough on all of us. Small businesses, including independently owned restaurants, have been particularly hard hit. Many have already closed, and it is estimated that an additional 50% of the small businesses in New Jersey that are currently open, may have to close. Fortunately, some businesses can serve as models because they have been successful in encouraging online ordering to replace in-person sales.

APP DESIGN CHALLENGE
Conduct research to find examples of small businesses that have successfully shifted a large percentage of their overall business to online sales. Try to identify strategies that are helping them survive and thrive. Then, choose a small, local business that you think will benefit from having an app because it does not currently have one. After selecting the business, gather information about key details (address, phone number, owner, staff, photo, etc.) as well as some of the important products and/or services that will be the focus of your app.

• PLATFORM: The app can be on any platform.
• PROGRAMMING LANGUAGE: Use any programming language.
• FUNCTIONALITY: The app must have some degree of functionality.
• CONTENT SUITABILITY: All content must be in good taste and observe all school rules.
• ORIGINALITY: The app must be original in design and content.
• VIDEO: Create a 1-3 minute video that contains the following information:
    • First name of each team member
    • The name of the app
    • Clearly explain the purpose of the app
    • The tools and coding language used to create the app
    • Show how the app works
• SUBMIT THE VIDEO through YouTube
• IN ADDITION submit a document that includes the following information:
    • Your ID number(s)
    • Title of the app
    • Explain the app in ONE sentence.
    • What is your app trying to accomplish? (200 characters max.)
    • What technical /coding difficulty did you face in programming your app, and how did you address this technical challenge? (500 characters max.)
    • With what you've learned, what improvements would you make to version 2.0 of our app? (500 characters max.)

EVALUATION
• VIDEO (50 points)
    • The purpose of the app is explained (10 points)
    • Tools and coding language are explained (10 points)
    • At least 3 features of the app are demonstrated and explained (30 points)
• DOCUMENTATION (50 points)
    • Written description of the app's purpose (10 points)
    • Technical difficulty and solution are explained (20 points)

- Improvements that should be included in version 2.0 are explained (20 points)

Computer-Aided Design (CAD), 2D Architecture

Design Problem:
Local residents, and visitors from nearby states and beyond, enjoy visiting the Jersey shore and think about having their own home on the water. Shore property is limited and expensive, but, fortunately, there are many affordable water view lots available in North Jersey lake communities. An experienced, rustic homebuilder needs help designing post and beam homes for some of the water view lots.

Design Brief:
Design a post and beam home that includes a 200-300 square foot loft, and a total area of 1600-1800 square feet. Since the builder and potential buyers are very interested in the water view, you may want to add an optional deck that will be available at extra cost to the buyer.

Specifications/Drawing Requirements:
- Working drawings that include a floor plan as well as front, side and rear elevations;
- Include notes that identify at least 5 features of post and beam construction;
- Include any other views that will enhance the presentation; and
- Use proper scale, dimensions and notes.

Computer-Aided Design (CAD) 3D, Engineering

Design Problem:
The Garden State Fastener Company purchases nuts, bolts, and washers in bulk, and packages them into a variety of containers for sale in hardware and big box home improvement stores. A recent unanticipated assembly line problem caused the mixing of three different kinds of fasteners. The company now has several huge barrels of nuts, bolts, and washers that must be sorted.

Design Brief:
Design a prototype machine that can sort three different kinds of fasteners into individual containers. The fasteners are ¼" x 20 x 1" long carriage bolts with nuts and washers. Manufacturer: BCP Fasteners, Model Number: BCP 278 (Amazon.com). The mixed fasteners will be poured into a hopper. Your machine must then sort the fasteners into three (3) different bins.

Specifications/Drawing Requirements:
- Include a parts list that identifies all the major mechanical and support components of the device;
- Show interior and exterior parts and mechanisms, including the hopper and collecting bins; and
- Include any views or renderings that will enhance the presentation.

Optical Engineering

Solar energy is an essential source of renewable energy. Common solar technologies include photovoltaic (PV) systems, concentrated solar power, and solar water heating. Solar concentrators are devices that work on the basic principle of focusing the sun with the help of an optical device. They can be used to increase the efficiency of solar thermal, or solar photovoltaic energy. You can do online research to learn more about solar concentrators.

Your challenge is to design and build a prototype solar concentrator system that utilizes at least two (2) lenses and a single 2V, 200mA solar cell. After building and refining your prototype, produce a short video (five minutes or less) that explains how you used the Engineering Design Process (EDP) to solve the problem, demonstrate use of the model solar concentrator, and show how it uses lenses to increase output of the solar cell.

The documentation portfolio, digital display (including prototype/device) and presentation video must be emailed to tsachall@tcnj.edu by March 29, 2021.