Capstone Project Declaration
Eng Tech

Answer the following questions. Do not reformat this document – keep the numbering and keep each answer separate. *Submit in pdf format via Slack message.* Your proposal is not approved until you have received a message of approval from the instructor via Slack. Take your time, thoroughly researching and planning the project in this pre-project activity. Treat this document as a professional project proposal and recall that it counts for 20% of your project grade. ESTIMATED TIME FOR PROPOSAL COMPLETION: 8-12 HOURS.

Do not use AI to answer the questions in this document. Answers that are obviously taken from chatGPT will be rejected for rewrite.
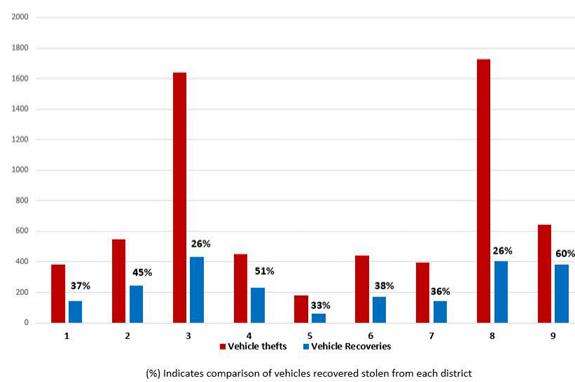
1. What is the problem you will be solving? State the problem <u>without</u> describing your solution.
   a) **High security when entering the house.**
   b) **Prevent the clothes from getting wet.**
2. Research this problem. Who experiences this problem? How many people would be impacted by your solution if it were a commercial product? Your answer must include some data.
   a) **High security when entering the house:**
   I will say it will impact everyone since we all want to have a high security for home:

Crimes Against Property

In 2023, property crime decreased by 5.7%. Burglary decreased by 16% with <mark>residential burglaries</mark> making up 44.7% of the total, while commercial burglaries accounted for 54.7% of the total. Robberies decreased by 83 cases or 6.5% compared to last year, and car-jackings made up approximately 5.9% of all robberies in 2023. Furthermore, the number of thefts decreased by 5.2%, and vehicle break-ins decreased by 6.95%. The number of vehicle thefts increased by 3.4% from 2022 to 2023, similar to the number of vehicle thefts reported in the mid-2010's.

Stolen Vehicles vs Recoveries by Council District - 2023

(%) Indicates comparison of vehicles recovered stolen from each district

b) Prevent the clothes from getting wet:
For those people who are still using clotheslines outdoors. I can guarantee that this will help a lot because it runs automatically, and especially, it will detect whether it's raining so that it can bring clothes inside to not get wet.

✦ AI Overview

The "issue rate" for an outdoor clothesline is not a single metric but is related to problems like slow drying in bad weather, potential stiffness, and the possibility of the line breaking due to wear and tear or heavy loads. These issues can be mitigated by proper placement, regular inspection, and choosing the right conditions for drying, but bad weather like rain, high humidity, or freezing temperatures will naturally slow the drying process. 🔗

Weather-related issues

- **Slow drying:** Rain, high humidity, and freezing temperatures can significantly slow down or stop drying.

- **Stiffness:** Clothes dried outside can sometimes feel stiff, especially thick items like towels or jeans. 🔗

3. What do you propose as a mechatronic solution to this problem? Give a complete and thorough, well-researched description of what you are planning to do for this project – this should be at least a paragraph long.
The main idea here is that I will use the **sheaves/pulleys**, and the **belt (using string here)** on the top to bring the clothes outside. How it can be operated is that I apply the **motor** on one end, controlled by the **Arduino kit** so that it starts up to bring clothes in or out depending on the weather. Another thing I need to install on the roof is the **raindrops detection sensor** (or any sensor that can detect water) and wires up into the arduino kit to control the logic and connect to the **motor** for clothesline. The house will be designed by **Fusion**, with all set up and hole implemented upfront, and will be cut out by **laser cut** or **3D printing**. The last thing that I will do is that all of the logic will be controlled by Arduino code. I will have a **RFID sensor** for the door so that if I use the correct keypad, then the door will be opened. If you provide a wrong keypad, then it doesn't activate the motor inside to open the door. I may need to use the **Arduino Mega board** since they have more pins that I can use for this project.

4. List your final project deliverable(s):
   - The house with the RFID sensor to control the entrance door, with the raindrops detection sensor to pull in the clothesline if there is rain.
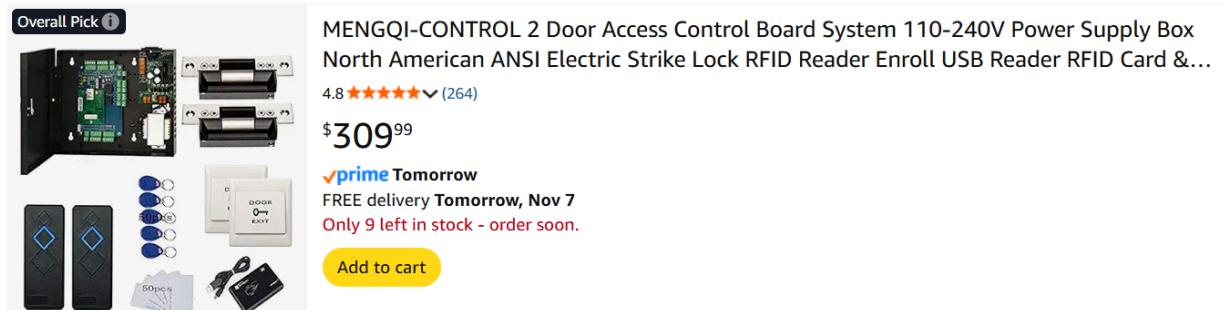
5. Does some version of your final deliverable(s) already exist in the marketplace?
   - For RFID, yes, they sell the entire kit on Amazon for $300:

Results

Check each product page for other buying options.

Overall Pick ⓘ

MENGQI-CONTROL 2 Door Access Control Board System 110-240V Power Supply Box North American ANSI Electric Strike Lock RFID Reader Enroll USB Reader RFID Card &...

4.8 ★★★★★ ⌄ (264)

$309⁹⁹

✓prime **Tomorrow**
FREE delivery **Tomorrow, Nov 7**
Only 9 left in stock - order soon.

Add to cart

- For the clothesline controlled by raindrops, I can't find any online since nowadays, not a lot of people use clotheslines for drying clothes. If they do, only to manage the pull in or pull out, not detecting the rain.

6. If so, how will yours be different?
    - Mine will be different from the others since I will find a way to activate the motor to open the gate after the RFID passes.

7. Next, you will define what "success" looks like for this project. For this part of your proposal, you will define five specific success criteria for this project. These criteria will be included word-for-word in your final presentation, where you will rate them as pass/fail. I will use these criteria to determine how well you executed your project for grading purposes. To make these criteria useful, they must be well-written, testable claims. Here are some tips for writing good functional criteria.
    - Short: Aim for one sentence each
    - Functional: Focus on what your project will do, not how it looks or how hard you worked
    - Measurable: A person unfamiliar with your project should be able to say "yes, you did this" or "no, you did not do this".

    Examples of well-written functional criteria:
    - The device turns on and off using a toggle switch.
    - The sensor can not be accidentally triggered when no object is present.
    - The arm lifts at least 100g of weight.
    - The system turns a page of the book without damaging the page.

    Examples of functional criteria that will be rejected for rewrite:
    - The parts are glued together and painted black. (This doesn't reflect function.)
    - The project will work fast and look good. (This can't be tested or measured.)
    - I will work really hard on this project. (This is already a project requirement.)
    - My project will demonstrate a comprehensive integration of various subsystems working together in harmony to achieve an innovative solution that aligns with my initial objectives, promotes collaborative learning, and leverages technology in a meaningful way to create a positive user experience and advance my understanding of engineering principles. (Too vague, impossible to evaluate, barely even possible to read. This is obviously from an AI model.)

Your five criteria:
   a. The door will be opened automatically when we use a correct keypad
   b. Create some greeting sound after the door opens
   c. My model house needs to assemble and disassemble by screw/fastener/3D design threads
   d. The clothesline can be pulled out and in by the motor.
   e. The clothesline's motor can be activated by the raindrops detected sensor.

8. What *electronic circuit design, configuration, and troubleshooting* will your solution require? If "none," you must have prior approval from the instructor.
   Everything below needs to be controlled by the Arduino Mega:
   - Motor for gate opening.
   - Motor for pulling the clothesline out.
   - All sensors used in this project.
   - Sound control

9. What *mechanical parts* will you need to design and fabricate for your solution? If "none," you must have prior approval from the instructor.
   So far: sheaves/pulley, belt mimicking, motors.

10. What *programming* will your solution require? If "none," you must have prior approval from the instructor.
    Arduino programming, with some external libraries included if the sensor is needed.

11. Your project must include a technical element that goes beyond what was taught in class. What new technical topic will you explore that you will teach the audience about during your presentation? This should be something the instructor has not already covered.
    - Spiral design in 3D CAD.
    - A speaker/alert after the door opens.
    - Applying sheave/pulley and belt.

12. Your project must include speaking with an industry professional about your project, getting advice from them about the project execution. What is the name, professional title, and company of the person you will speak to about your project? Why is this person's advice relevant for this project?
    Khanh Nguyen - Process Manufacturing Engineer - Super Micro Computer.
    → He has a strong background in working in the real-life semiconductor industry. Also, he graduated from UC San Diego with a B.S. Electrical Engineering, so I strongly believe that if I struggle in the electrical area, he can help me.

13. List three ways in which this project will help you to learn/grow as a technician. These can be related to soft skills and/or technical skills.
    a. Creativity
    b. Problem-solving
    c. Troubleshooting

14. What do you think will be the most difficult part of this project for you? What specifically are you doing now, in the pre-project phase, to avoid having this difficulty derail your plan?
Come up with the model house design from Fusion and how I can connect the RFID with the door opening motor.

15. Using the Task List document template provided, break down your project into individual milestones/tasks. Approximate the amount of time each task will require. Tentatively assign each task to one of the remaining weeks of class.
☑ I have completed this document for submission

16. Using the Bill of Materials document template provided, create a parts list for your project. Make a plan to purchase or borrow items if necessary. Use the document to calculate the expected cost of your project.
☑ I have completed this document for submission