**Provided by professor**:

* CSU UAV
* 3rd-Annual CSU 3D Printed Fixed-Wing Aircraft Competition (C-3DPAC)
* 2nd-Annual CSU California Uncrewed Aerial System Competition (C-UASC)
* Navy Robotics Mobility Challenge (robot rodeo?)

**Ideas**:

* Robotic Mapping
  + For dark rooms/caves
  + Requires robotic autonomous movement
    - Needs to possibly handle rough terrain
    - Ultrasonic sensors and stuff for closer object navigation
  + The question is how to map
    - Lidar is expensive
* <https://en.wikipedia.org/wiki/Voith_Schneider_Propeller>
  + for drones
  + <https://www.facebook.com/eVTOLmag/videos/cyclotech-first-flight/416842253169151/>
* AI-Controlled Sawyer Sorting
  + **Quick Overview**: This project would involve use of AI and robotics. The robotic arm uses computer vision to determine where the specific item would be organized into. The problem could be to sort items for recycling, or trash (compost later maybe). A different potential problem could be for determining different components for manufacturing.
    - *Recycling Facilities*: Sawyer could be in recycling plants to automatically sort plastics, metals, and glass, significantly improving efficiency and reducing human labor.
    - *Manufacturing*: In production lines sawyer could separate defective materials or raw materials into categories, helping streamline manufacturing processes.
    - *Sustainability Efforts*: The project directly contributes to sustainable practices by improving recycling rates and ensuring materials are sorted for reuse. Could even teach others which materials get recycled to which corresponding bin.
  + **Sensor Design**: For sorting sawyer can have extra sensors along with vision to determine the material. Such as spectrometers to detect the material composition based on light reflected, or even inductive/capacitive sensors which can be used to detect conductive materials like metals/plastics.
    - Electrical elements are involved in cases for adding external sensors. Designing circuits, embedding sensors into the control structure would be involved.
  + **Mechanical Design**: For object manipulation we could modify the gripper with other components to work better for object manipulation with certain objects.
  + **AI/Machine learning**: AI would be used to process sensor data in real-time to make the decisions (like it is the brain for the operation). With a collection of datasets this could provide insightful information to create more accurate decisions. Using both of these would help learning and adaptation when presented with different materials
  + **Automation Design**: We would have to create a closed-loop which sawyer uses the sensor data to adjust to the situation and properly grip the object. In this loop the process for identifying the material to be sorted would be autonomous.
  + **ABET Consideration**: This would work well due to the extensive design involved with the project, and its alignment with ABET’s design-oriented requirements.
    - *Engineering Standards*: Making sure to maintain safety standards with robotics, electrical systems, and AI software.
    - *Ethics*: The project can be marketed to contribute sustainability involving recycling and material management making it eco-friendly.
    - *Multidisciplinary Involvement*: This project would use multiple engineering domains such as mechanical, electrical, and computer science. *Constraints/Trade-offs*: We would have to make decisions on cost, material selection, and system reliability which would need to be balanced
* Designing a robot using compliant mechanisms
  + **Overall idea could be used in other projects**
  + needs some sort of challenge to complete though
  + also would require a different 3d printing material than PLA
    - <https://youtu.be/C-SbMsYNTxM?si=NNA8CApE5hy3nMhl>
    - PLA could work, though my initial designs had difficulty
  + Rolling contact joints?!
    - <https://youtu.be/TQiLLcumqDw?si=awLtjUFLEZudhynN>
* Autonomous robot conversion kit
  + a easy to add/remove suite of parts that could change any robot into one capable of autonomous driving
  + most of the code for autonomous driving would be on the boards that are part of the kit, with minimal extra coding required to have the kit talk with the robot's particular motor setup
* Roaming home security system
  + can roam by itself through a house
    - for the purpose of the project, we’ll aim for room navigation
    - perhaps sets of 2 ultrasonic sensors at different heights to defeat tables
  + has sound sensors to detect voices and other loud noises
    - means robot motors will need to be quiet
  + has passive IR sensors to detect body heat (like some home security systems)
    - needs more research, not sure if it will work on a moving platform
    - the alternative is an IR camera
      * the robotics lab may have one to borrow
  + has speakers and lights to make an alert when something is detected