# Engineering Study Guide

General Robot

- Competition robot is called Jaws
- Prototype robot is called Inertia
- Materials on robot:
    - Copper wires
    - Aluminum for frame and numerous other areas
    - Rubber for shooter stop
    - High Density Polyethylene for wheel modules
    - Nylon for nyloc nuts and spring spindles
    - Steel for cam and most of bolts
    - Polyvinyl Chloride for spacers and ball holder
    - Polypropylene for spacer on pneumatic actuator
    - Wood for inside PVC on manipulation
- Changes to decrease weight:
    - Steel bolts to aluminum bolts
    - Cut down HDPE blocks on drive train
    - Changed design of metal shooter arm
- Energy forms used on our robot:
    - Springs
    - Electrical
    - Pneumatic
    - We do NOT use nuclear power. If you get that wrong on the test, I will hunt you down.

Shooter Subsystem

- The CAM lowers the shooter.
- CAM Shape:
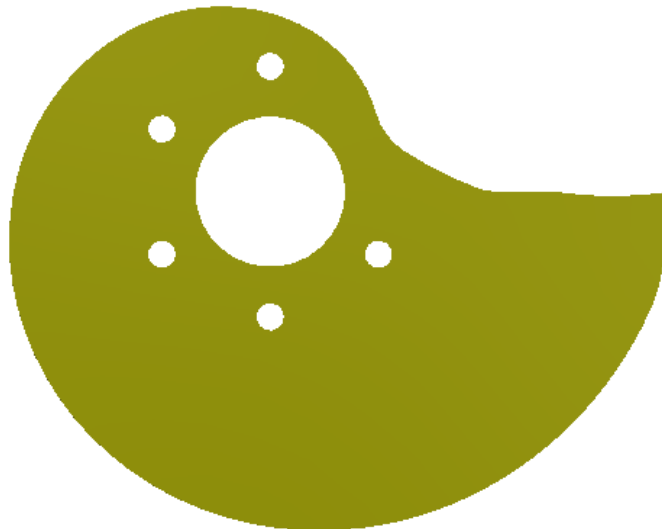
- Motors are 2 MiniCIMS

- Gearboxes are 2 ToughBox Nanos
- Constant force springs at 24.8 pounds
- Tested launch angle for ball

Manipulation Subsystem

- Motor is 1 BaneBot
- Wood-holding shaft in PVC
- 2 pneumatic actuators
- Tested whether intake could collect over the bumpers

Drive Train Subsystem

- 2 Sonic shifters change gear ratio with pneumatic actuators
- 8 wheel drive with 4" outer diameter Hi-Grip traction wheel
- Outer wheels are 1/8" higher than the inner drive wheels

Controls

- Encoders measure motor rotations, are used with PID values to make a closed loop system for the Cam shooter
- We code the robot in C++ with LabView for image manipulation from the camera
- We use Pulse Width Manipulation to communicate with motor controllers
- PID = Proportional Integral Derivative, used for reaching targets
- We don't use Victors or Jaguars, but we use 7 Talons (4 for drive train, 2 for shooter, 1 for manipulation)
- We had to test the shooter and tune PID values for the CAM shooter