



## The Reverse Engineering Project

Fairfield University MEEG3311 Fall 2021

**OBJECTIVE:** Pick a device that contains some of the machine components that we will study this semester, understand how it works and is loaded, and estimate its static factor of safety and its (fatigue) life. In teams, produce a written and ~15-20 minute oral report on the device.

**INGREDIENTS:** All teams should generate the following items:

- 1 Measurements & Sketches
- 2 List of Assumptions
- 3 Free Body Diagrams
- 4 Test Results
- 5 Stress Analysis of Each Component
- 6 Static Factor of Safety for Each Component
- 7 Life (Fatigue) Analysis for Each Component
- 8 Identification of the "Weakest Link" - Static and Dynamic
- 9 Notes on How Device Could Be Improved
- 10 Notes on How Analysis Could Be Improved
- 11 A Written Report
- 12 An Oral Team Presentation To The Class

Here are some devices that have been dissected in past years:

Device	Components
Ratcheting Tie Down	Spring, Frame, Hook
AirSoft Rifle	Barrel, Springs, Bolt Arm
Bike Chain Link Tool	Screw, Handle, Chain
Cork Remover	Frame, Arms, Screw
Manual Garage Door Opener	Spring, Arm, Linkage
Pogo Stick	Spring, Foot Peg, Pins
Stapler	Springs, Handle, Pin, Staple
IV Clamp	Screw Clamp, Frame, Plastic Handle
Car Scissors Jack	Screw, Frame, Bearing, Handle
3-Hole Punch	Arm, Spring, Punch
Bicycle Transmission	Crank, Spindle, Chain/Sprocket
Bicycle Brake	Spring, Arm, Bushing
C-Clamp	Screw, Frame, Handle
Bicycle Frame	Frame, Crank, Chain, Bearings

### RECOMMENDATIONS:

- Pick a device that you can have access to for most of the semester.
- Consider buying something inexpensively at a thrift shop or tag sale, so that you needn't restore it to working condition after the project.
- Plan your project work with a calendar to pace its progress.
- Consider doing some level of testing (nondestructive or destructive) on the device. Arrange in advance to use school labs.
- Arrange your project so all team members have about equal shares of the tasks. Generally assign one component to each team member.
- Spend some time as a team trying to understand the device before turning to Google.
- Visualize what graphs, sketches, and photos will be appropriate for your final reports while you are generating them the first time.
- Take "before" pictures.
- If you aren't sure of something, establish an assumption.
- Slides & Report must have figures of each component analyzed, showing loads and stress locations.