

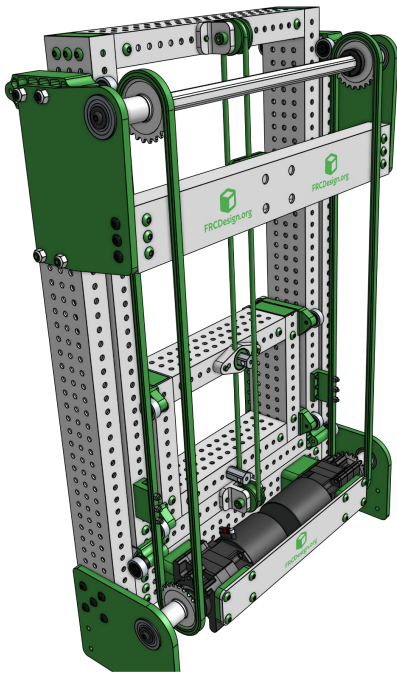
FRCDesign.org - An Open source Advanced CAD and Engineering Design Course for Highschool Robotics (Curriculum Exchange)

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Jonathan Mi is a doctorate student in the Robotics department at the University of Michigan, Ann Arbor. His research is focused on hardware and control of soft and tensegrity robots.



An open source, free, learning course for learning **advanced computer aided robot design** for competitive **high school** robotics in the **FIRST Robotics Competition** using **Onshape**.



Making advanced robot design education equitable, accessible, and efficient.

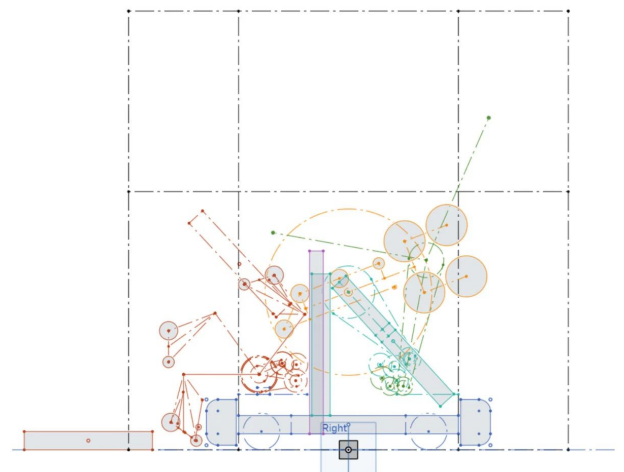
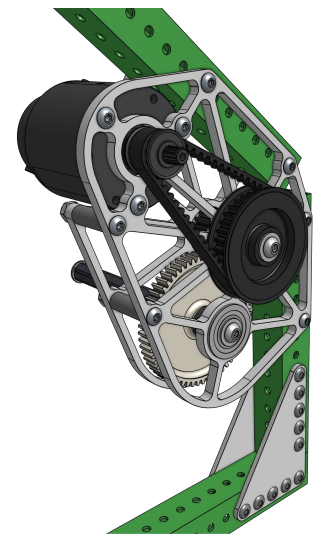
A top down CAD approach for a self paced learner or classroom.

80+ hours of **active learning**, content.

5.4k active monthly users.

Tested and built using frequent user feedback and learning principles.

Builds proficiency in creating 100+ part assemblies and multi body, parametric modeling in **months instead of years**.



Approach:

Stage System:

Indicates major breakpoints in progression:

Stage 0: Initial Setup of Onshape and necessary tools.

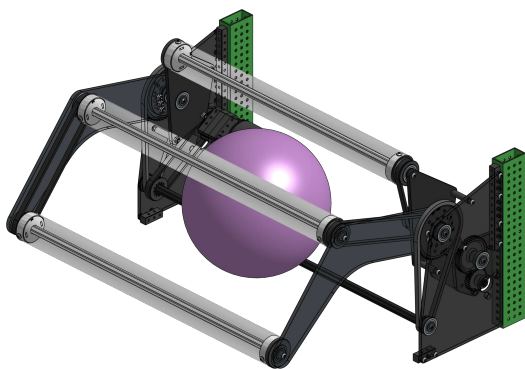
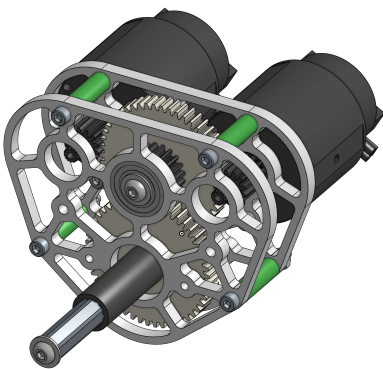
Stage 1: Building top-down design and multi-body model CAD proficiency using relevant robot design.

Stage 2: Integrating engineering principles into full subassembly mechanism design.

Stage 3 (WIP): Top-Down full robot design with complex multi assembly designs.

Stage 4 (WIP): Learning how to improve past the course through reflection and independent learning.

Example exercises:



Course Design:

Intentional information placement and scaffolding for maximum retention. Information is placed "Just in Time" when the learner needs to use it.

Metacognition and **skill building** focus to help students improve quickly w/ focusing on improvement sections.

Designed for the **flipped classroom** approach with an **Educator's Guide**.

Skill development built through **interleaving** instead of repetition. Skills are built through varied exercises of different contexts.

Active, project based, learning balancing declarative, procedural, and conditional knowledge. This ensures **deep learning** and integrated knowledge in different, applied contexts.

Knowledge built through inferring, discovery, and relationships. **No rote memorization.**

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