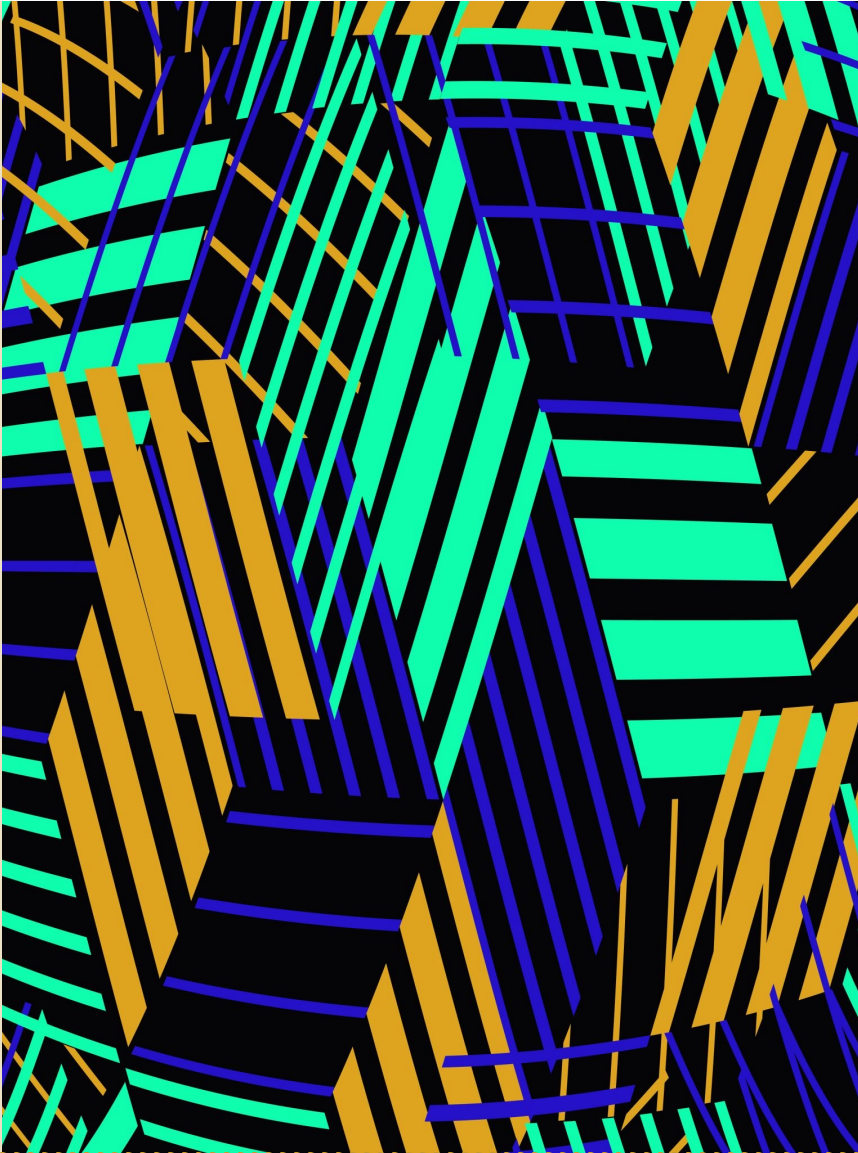


# Robotics Alliance Project Design Guide

Assigned Reading & Reflection  
Questions

Set #3

Due Wednesday, 11/10



# Reading Assignment #3



Section 4 (pages 57-97)



Reflection Questions  
(listed on following slides)

# Question 1: Brushed and Brushless Motors

- ♦ Find an internet resource that explains the difference between brushed and brushless motors. Describe the differences in your own words. Include the link to your chosen webpage.

# Question 2: Motor Specs

- ♦ List and define with units the most useful motor specs.

# Question 3: Motors for Mechanisms

- Which motors are best for intakes? Drivetrains? What are the similar properties of these motors based on use case?

# Question 4: Motor Curves

- ♦ Watch the 973 motor curve video. Explain in your own words how a motor curve works. Paste images of the motor curves for a NEO, NEO550, RS775 Pro, CIM and a Falcon 500.
  - ♦ [FRC 973 Motor Curve Video](#)

# Question 5: Torque & Speed

- Explain the relationship between torque and speed in motors.

# Question 6: Torque, Power & Speed

- ◆ When you double the number of motors in a mechanism, what happens to:
  - ◆ Torque
  - ◆ Speed
  - ◆ Power
- ◆ Why?



# Question 7: Reduction

- ♦ Define reduction. How can you achieve reduction in a mechanism?

# Question 8: Free Speed & Output Speed

- Create a flowchart for how to convert free speed into output speed with the JVN spreadsheet.

# Question 9: VersaPlanetary

- What is a versaplanetary gearbox? Sketch a diagram and label each section of the gearbox.

# Question 10: Reduction Stages

- Where should the highest reduction stage go? Why?

# Question 11: Versa Vs Ultra VS AM Sport

- Compare and contrast the versaplanetary, ultraplanetary and AndyMark Sport gearboxes.

# Question 12: Servo Motor

- What is a servo motor? What kinds of mechanisms are they used for?

# Question 14: Bearings

- What are bearings used for? List the different types of bearings and their uses.

# Question 15: Bushings

- What is a bushing? What are their uses cases?



# Question 16: Live & Dead Axles

- What is a live axle? What is a dead axle?

# Question 17: Torque Transfer Shafts

- ♦ Fill in the table of torque transfer shaft profiles below.

Type	Sketch of Profile	Common Sizes	Vendor	Description/Use Cases
Hex Shaft				
Thunderhex				
Round Keyed				
D Profile				
Square				

# Question 18: Gears 101

- Define “gear.” What does “DP” mean? What is “pressure angle?”

# Question 19: Gear Comparisons

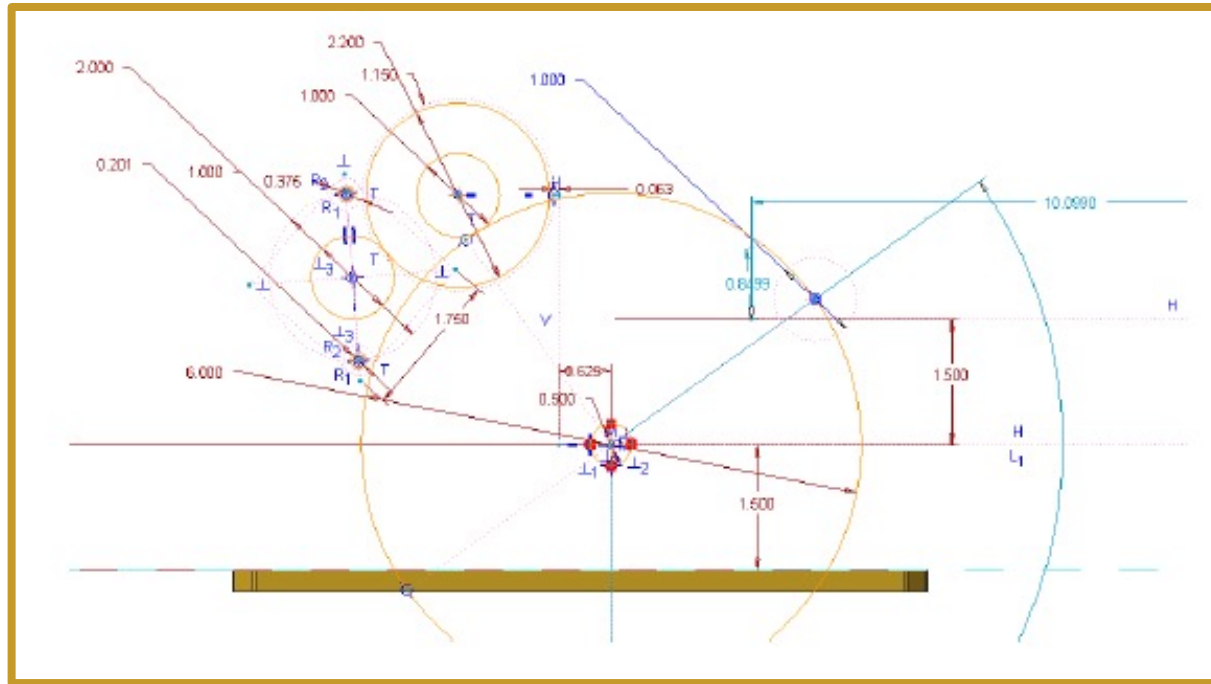
- Compare and contrast different gear types and describe their use cases.

# Question 20: Designing with Gears

- ♦ What variables are most important in gear design? List, define and write equations for center-to-center distance and pitch diameter. Define all variables used.
- ♦ Define pitch diameter.

# Question 21: 2D Sketch with Gears

- Label where the gears are located in the annotated sketch excerpt from the manual below. Annotate your sketch so an outsider can understand what is going on.



# Question 22: Chain 101

- What are the differences between #25, #35 and bike chain?
- What are master and half links used for?

# Question 23: Designing with Chain & Sprocket

- ♦ What design factors are important for chain and sprocket mechanisms?
- ♦ Why would you add additional length on your sprocket center to center distance? How much length should you add?



# Question 24: Belt & Pulley

- When would you use belt and pulley vs chain and sprocket?

# Question 25: HTD vs GT2

- Describe, compare and contrast HTD and GT2 belts.

# Question 26: Belt & Pulley Design

- ♦ What factors are key in belt and pulley design?
- ♦ List, define and write equations for pitch length and pitch diameter. Define all variables used.

# Question 27: Belt Calc's

- ♦ Find pitch length given the following:
  - ♦ Pitch = 3mm
  - ♦ Number Teeth = 36
- ♦ Find pitch diameter given the following:
  - ♦ Pitch = 5mm
  - ♦ Number Teeth = 60

# Question 28: Polycord

- What is polycord and what are its use cases? What are the pros and cons of polycord?

# Question 29: Racks & Pinions

- How does a rack and pinion mechanism work? Create a sketch of a rack and pinion system.

# Question 30: Elevators

- ♦ Watch the FRC973 Elevator Videos
  - ♦ [Part 1](#)
  - ♦ [Part 2](#)
  - ♦ [Part 3](#)
- ♦ How are elevators typically driven?

YOU MADE IT TO  
THE END SORRY  
THAT WAS SO  
LONG BUT FRC IS  
COMPLIATED!

