FAMU-FSU College of Engineering

Fluid Power Vehicle Challenge – T506

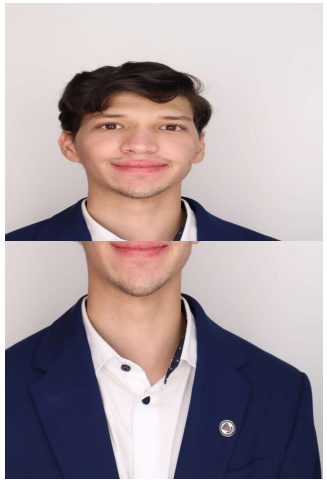
Design Review 5

February 18th, 2025

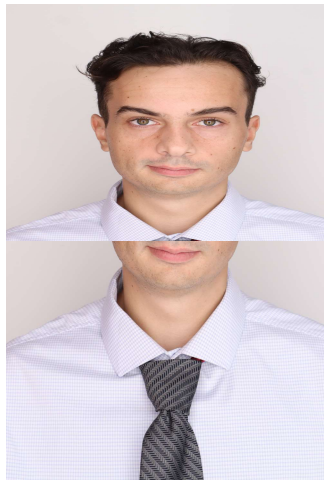
Team 506: Introductions

Adonay Almanza-Enriquez
Controls Engineer
Presenter

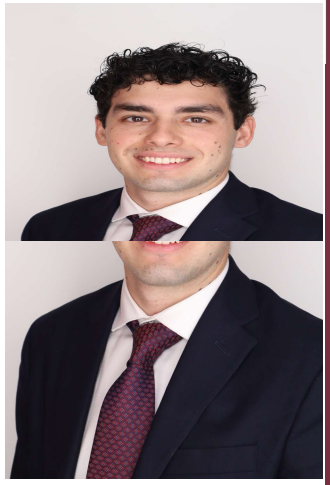
Trace Flowers
Modeling & Simulation Engineer
Presenter



Daniel Garmendia
Quality Engineer
Presenter



Ethan Mercado
Systems Engineer



Gabriel Vazquez
Design Engineer

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Sponsors and Advisors

Hakeem Rhodes
Dow Sponsor

Marcus Rideaux
Dow Sponsor

Mohd Yousuf Ali, Ph.D.
FAMU-FSU College of Engineering Advisor

Dr. Shayne McConomy
FAMU-FSU College of Engineering Advisor

FAMU-FSU College of Engineering

Daniel Garmendia

Competition Mentors

Cory Fisher
Sun Hydraulics

Dean EberHardt
IFP Motion Solutions

FAMU-FSU College of Engineering

Daniel
Garmendia

NFPA Fluid Power VEHICLE Challenge

Objective

The objective of the project is to design a fluid-powered vehicle with the aim of competing in the competition organized by the NFPA (National Fluid power Association)

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Background

- Brakes
- Single-Rider
- Reservoir
- Accumulator
- Pressure Gauge

Arizona State University

Daniel Garmendia

FAMU-FSU College of Engineering

Daniel
Garmendia

Challenges

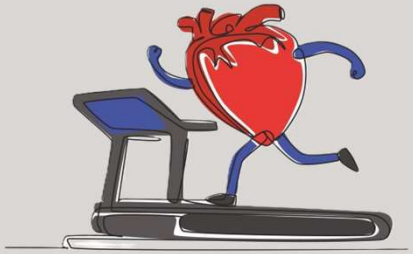
Sprint Race

Time < 30 [Seconds]

Efficiency Race

Efficiency > 20 [%]

Endurance Race



Distance > 2000 [Feet]

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Engineering

Key Goals

Meet the requirements and safety guidelines of the challenge

Complete all the races and place first in at least one award category

Produce comprehensive documentation for future team's success

Daniel Garmendia

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Scoring and Awards

Midway Review &
Final Presentation

15

Sprint Race
Efficiency Race
Endurance Race

9

FPVC Mentorship
Regenerative Braking

7

12 Award Categories

Total Cash Prizes: $12500

Daniel
Garmendia

Breakdown of Awards

Pneumatics: $1000

Electronics: $1000

Design: $1000

Races: $4500

Workmanship: $1000

Teamwork: $1000

Presentations: $2000

Safety: $1000

Daniel Garmendia

FAMU-FSU College of Engineering

Daniel Garmendia

Results and Critiques

Scoring	Critique	Praise
Midway Review: 3.82/5 ★	Calculation: Incline was not steep enough to be competitive in sprint race	Overall quality and depth of the presentation

$1000

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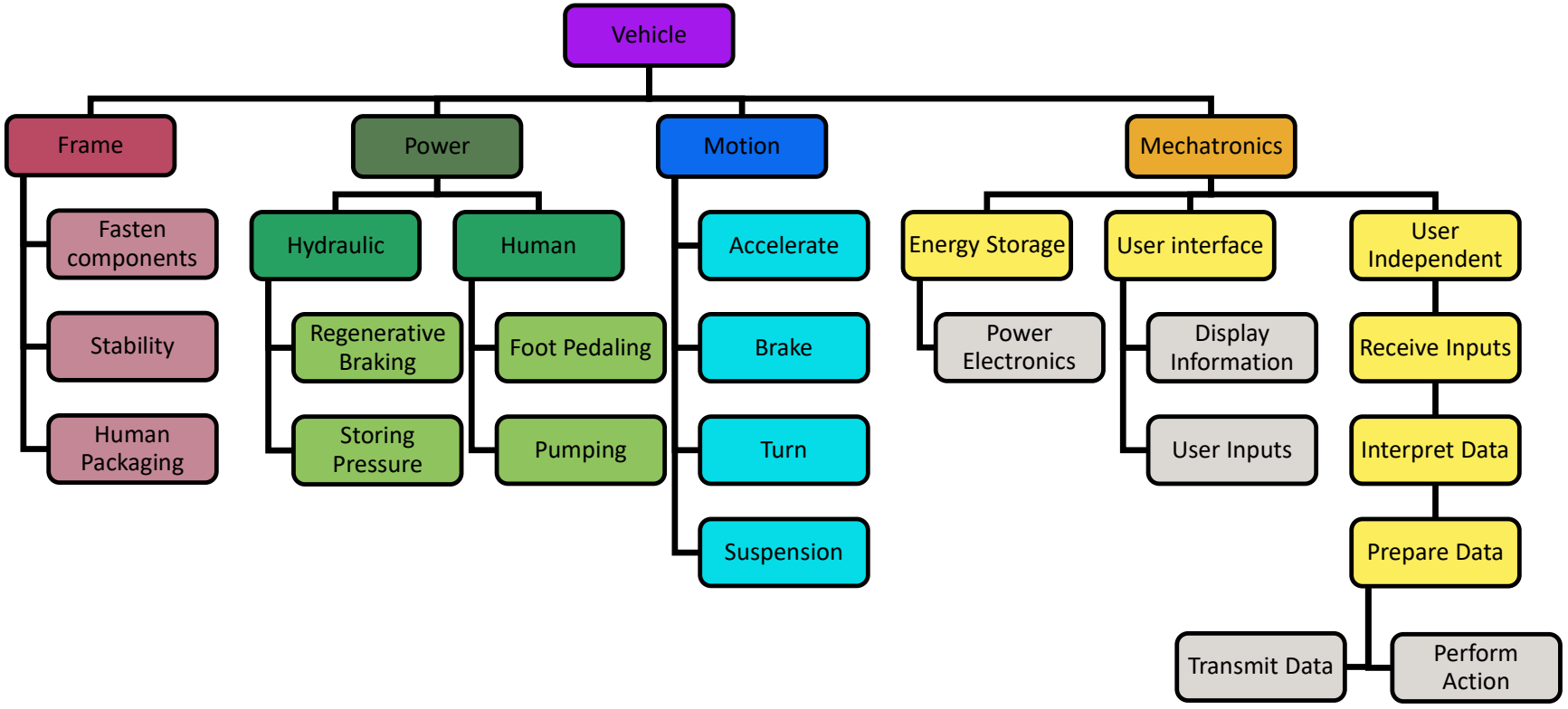
Functional Hierarchy Chart



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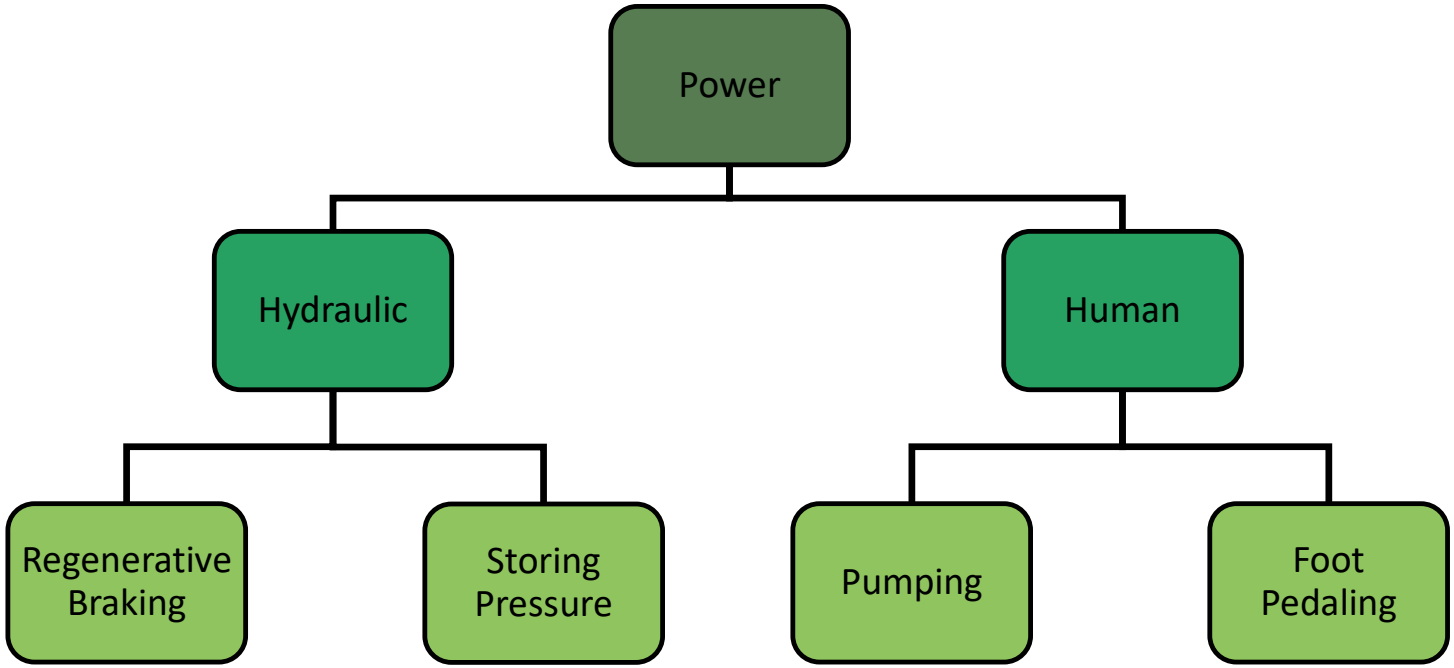
Power Functions



Daniel Garmendia

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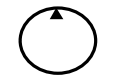
Hydraulic Diagrams


Pump


Gauge


Motor


Normally Open Solenoid Valve


Check Valve

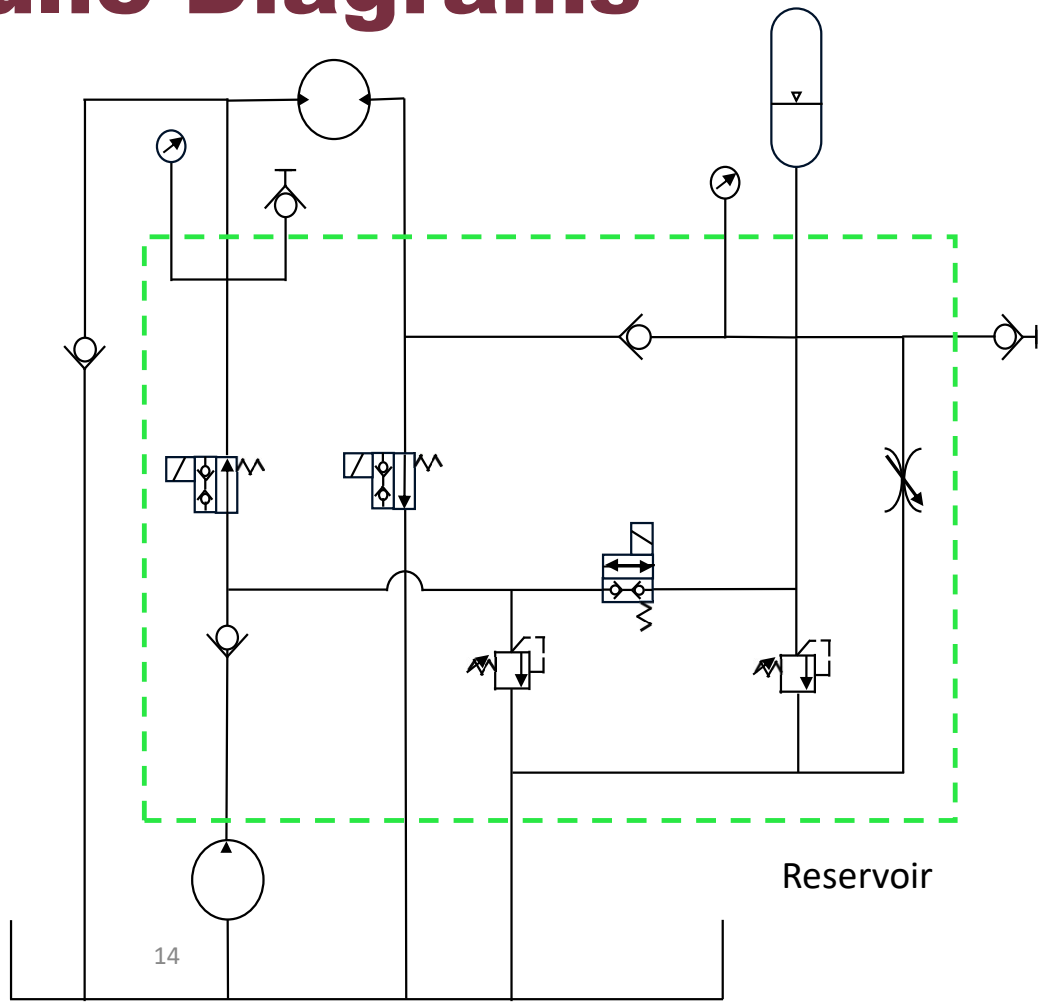

Accumulator


Test Point


Flow Control Valve


Normally Closed Solenoid Valve


Pressure Relief Valve



Trace Flowers

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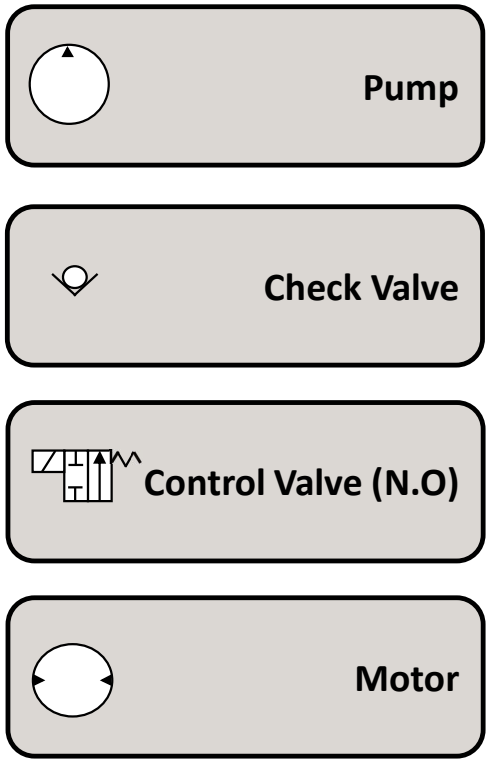
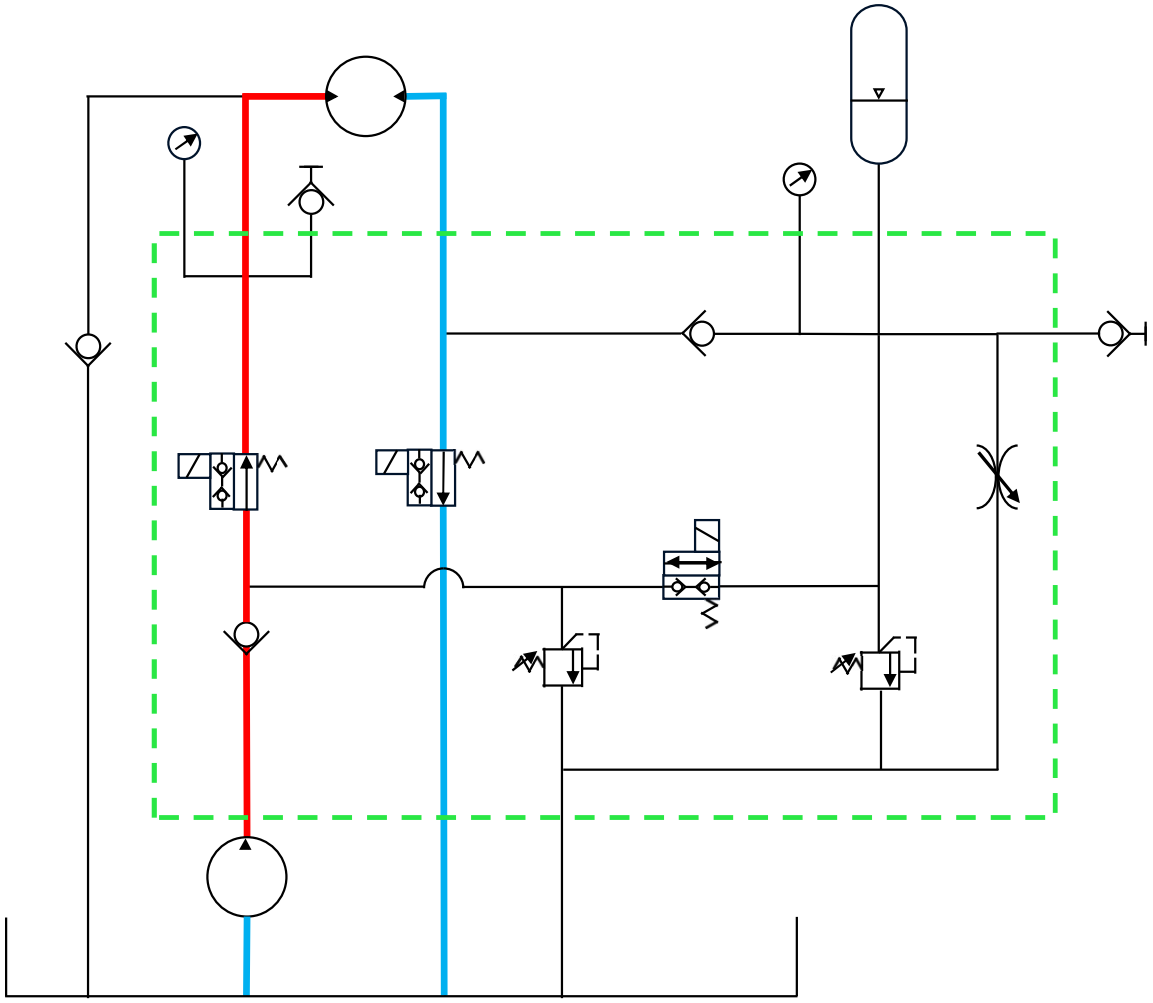
Direct Drive





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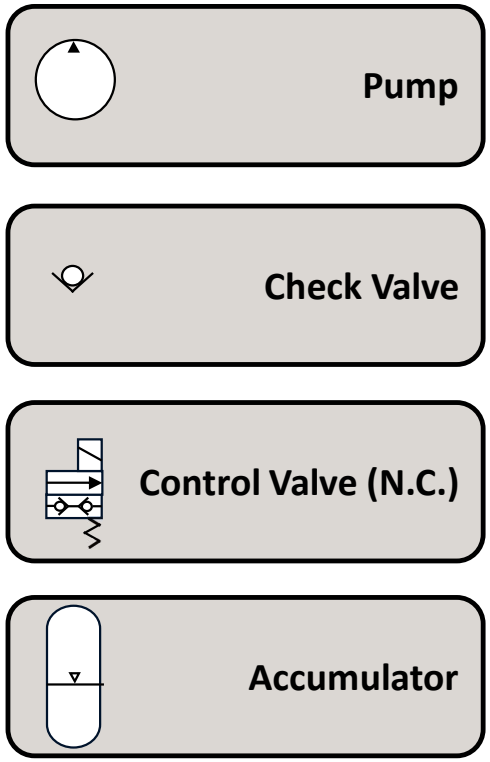
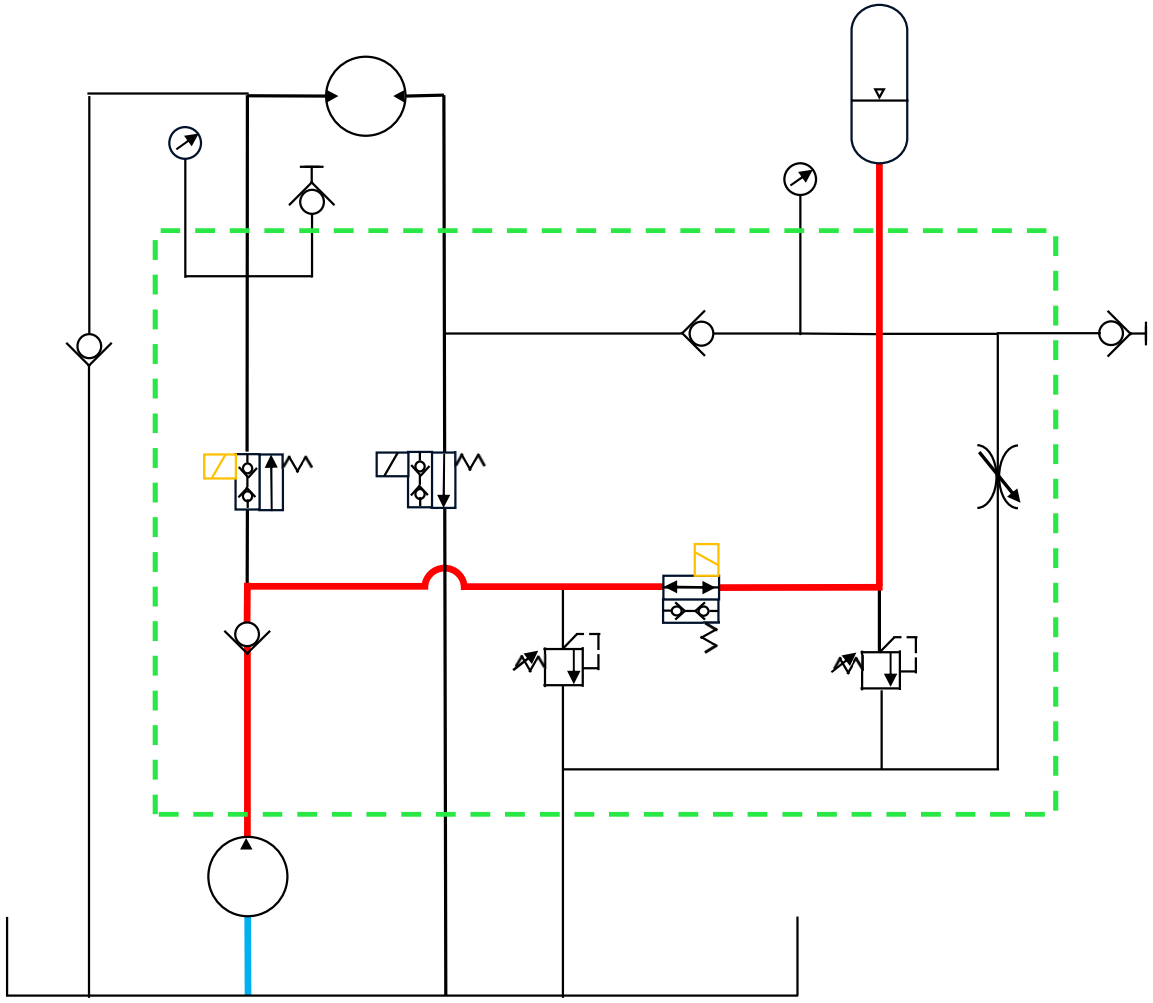
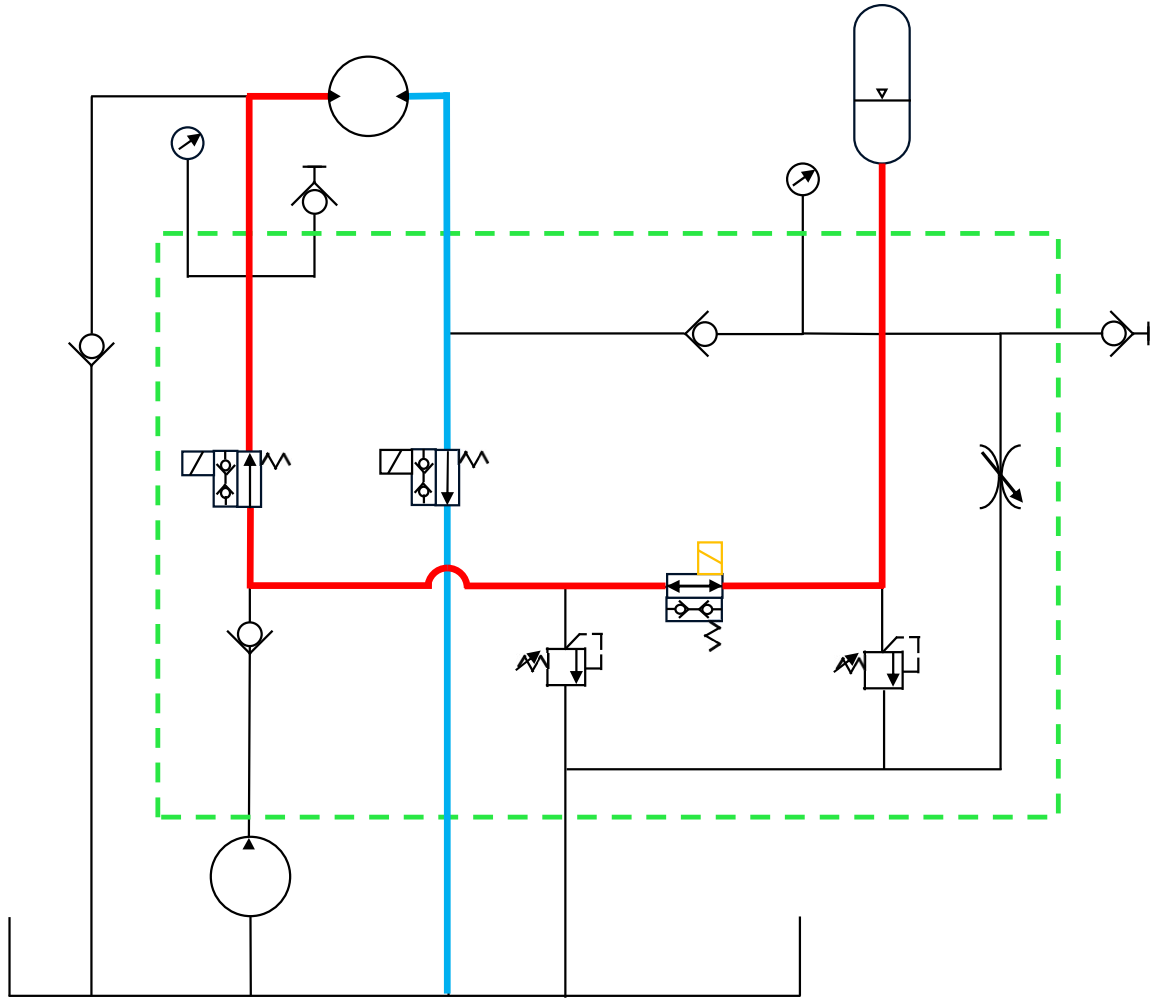
Stationary Charging Mode





Trace Flowers

Discharge Mode



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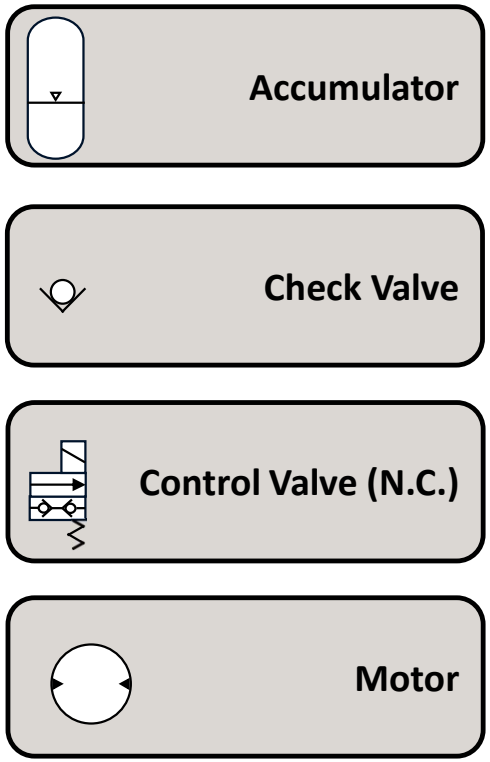
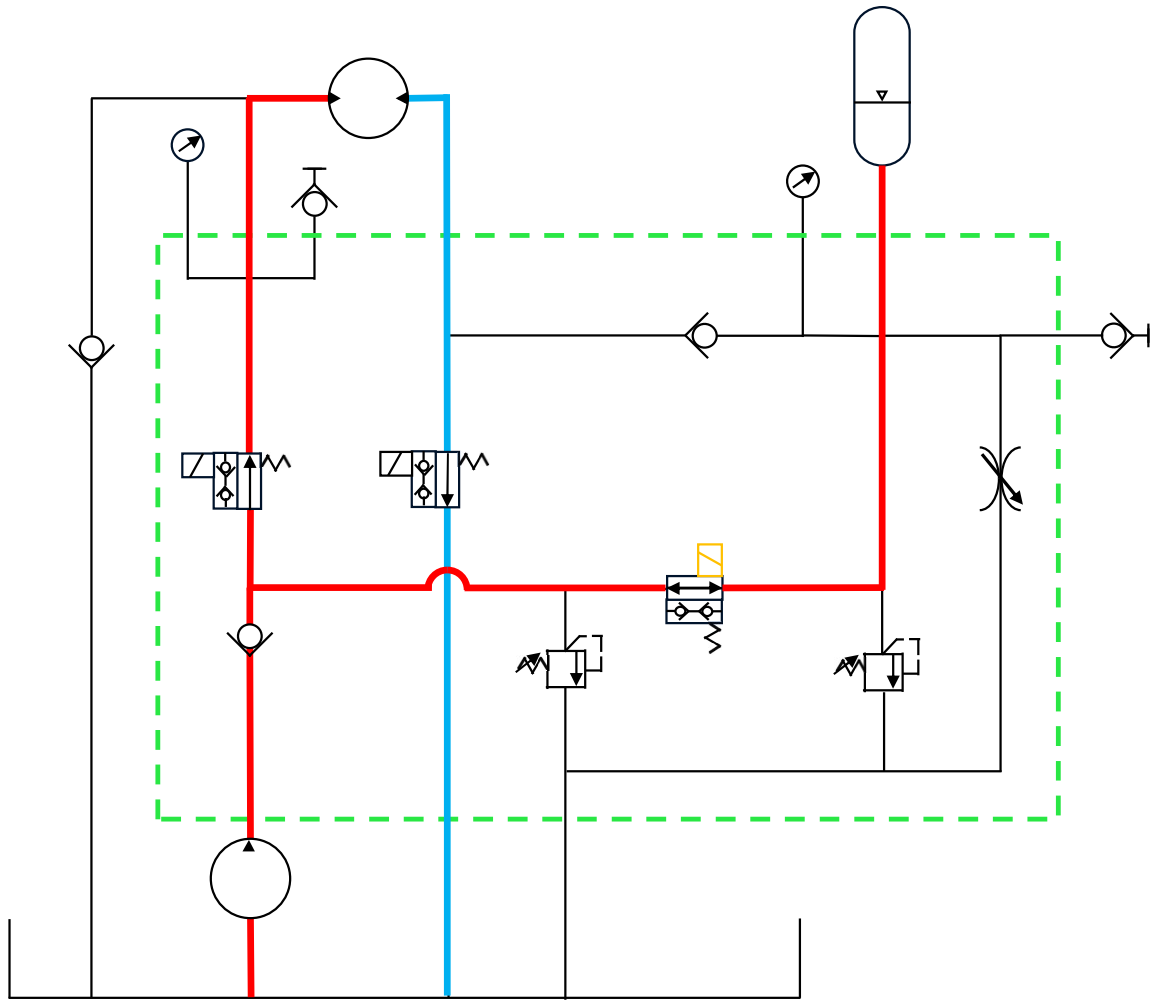
Discharge Mode Boost





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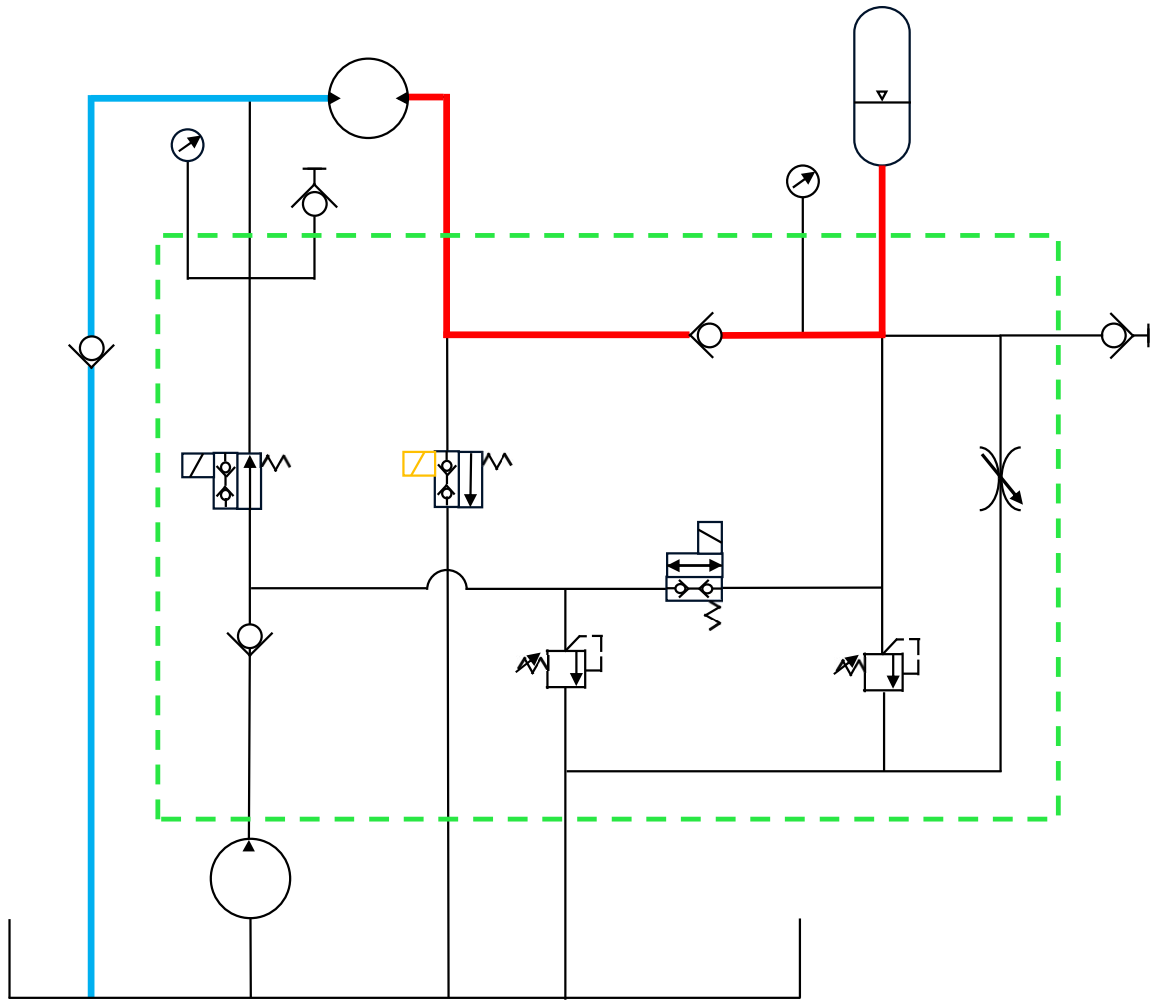
Regenerative Braking

Check Valve

Motor

Control Valve (N.C.)

Accumulator



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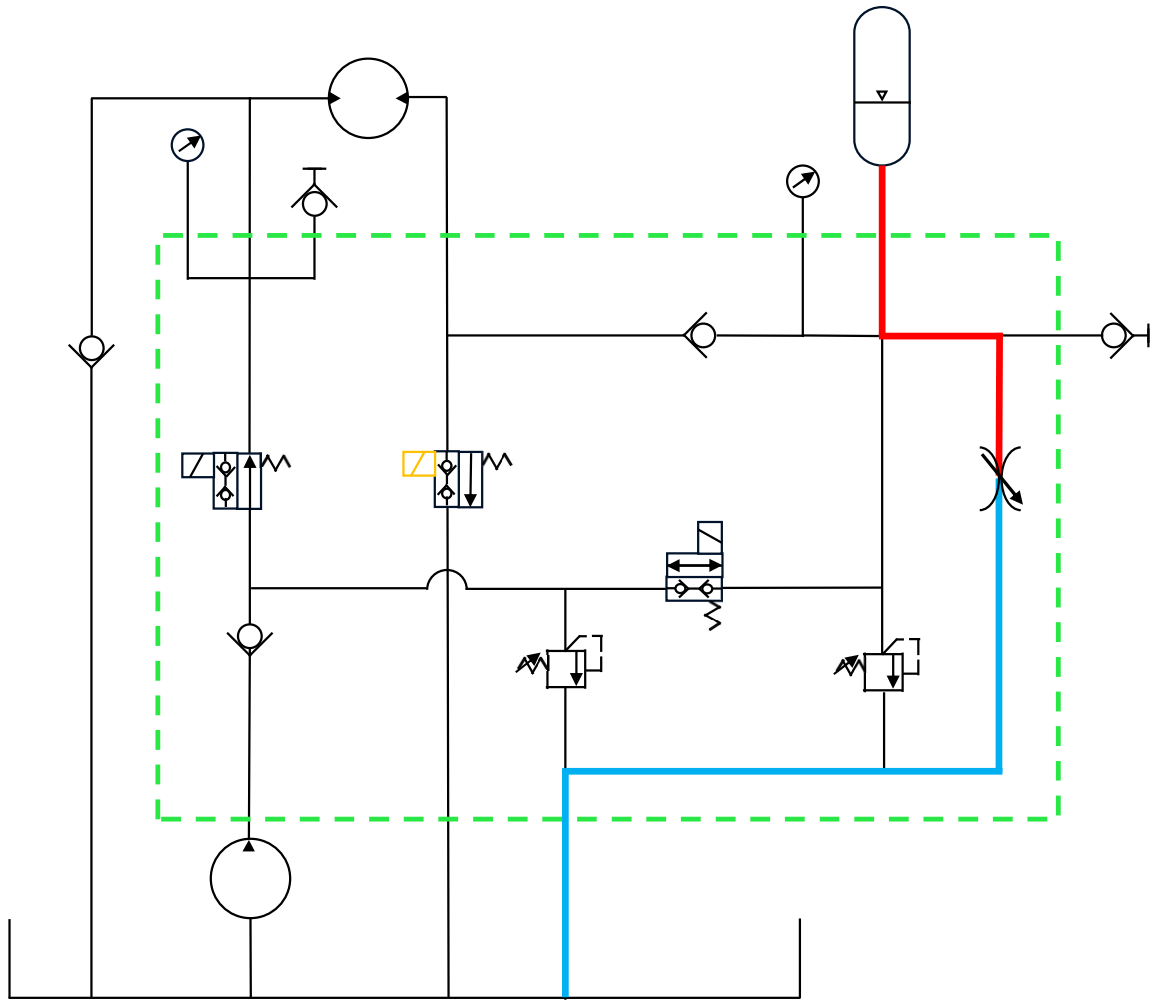
Pressure Release

Accumulator

Flow Control Valve



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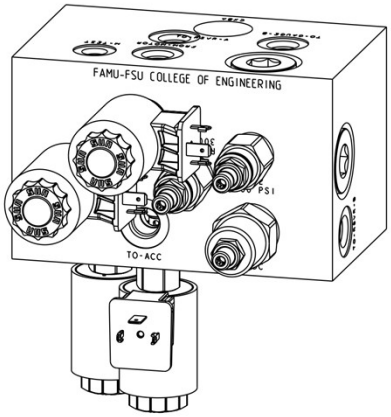
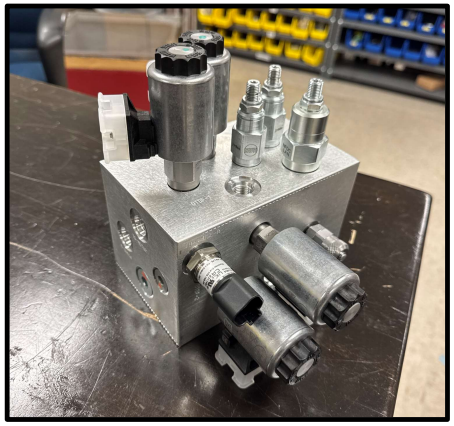
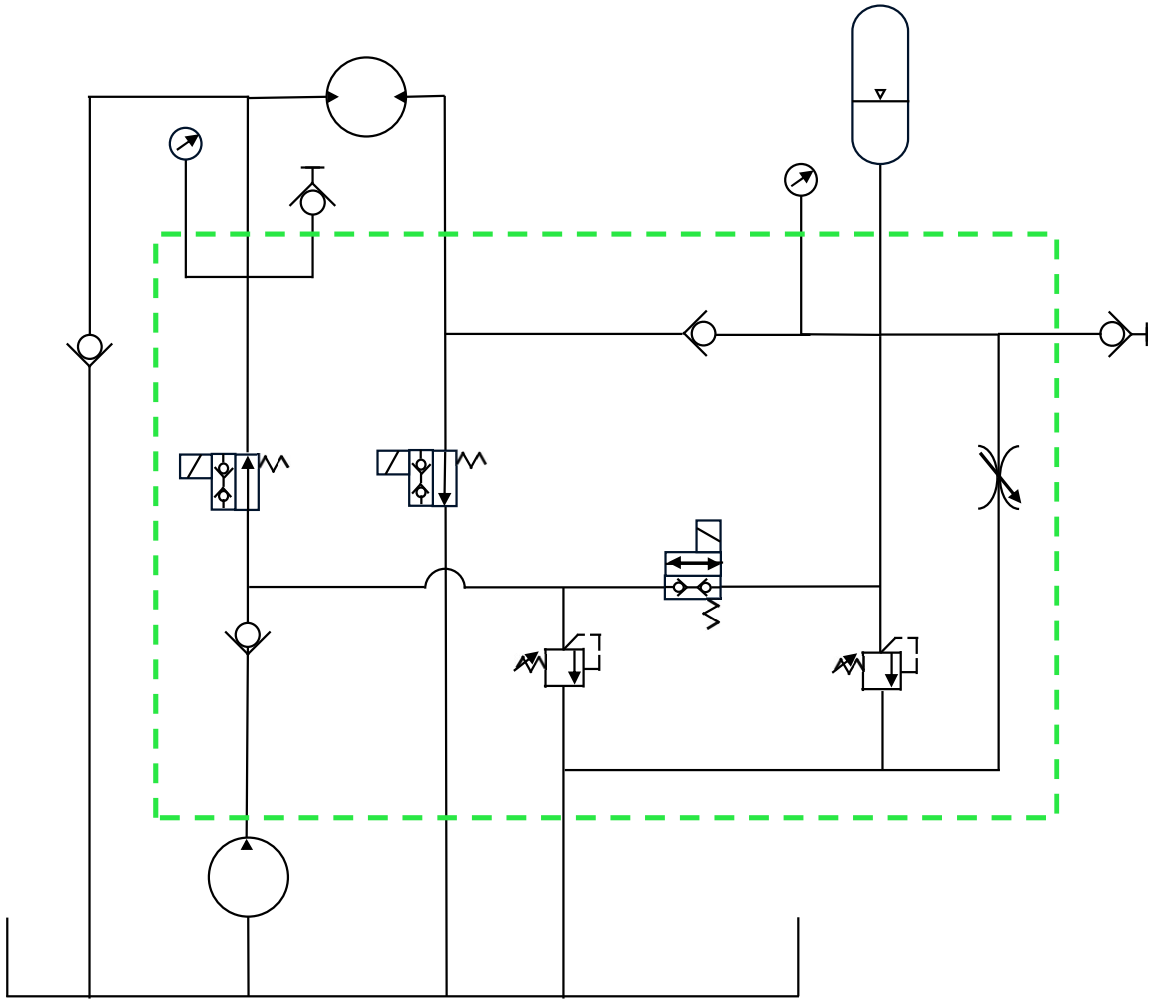
Manifold







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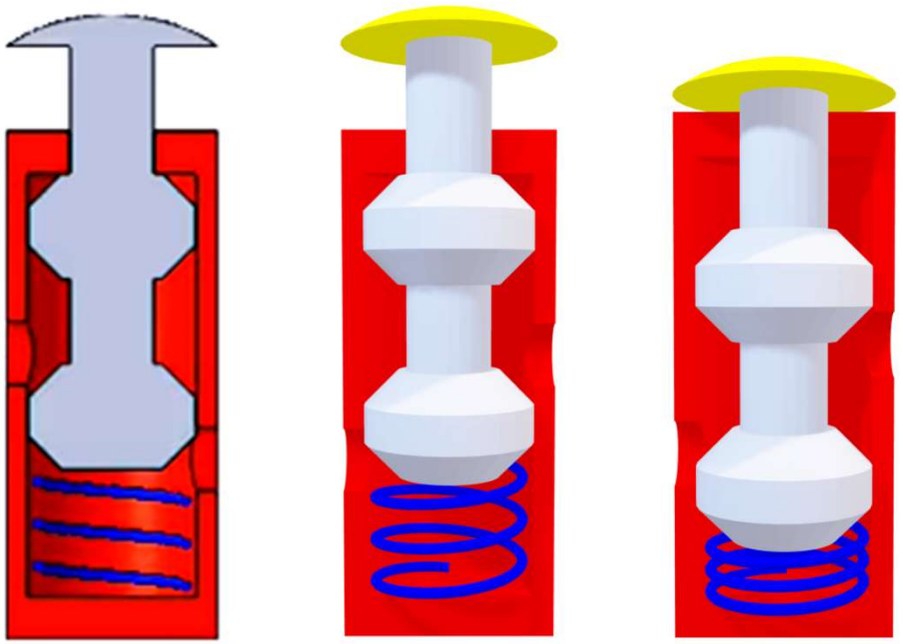
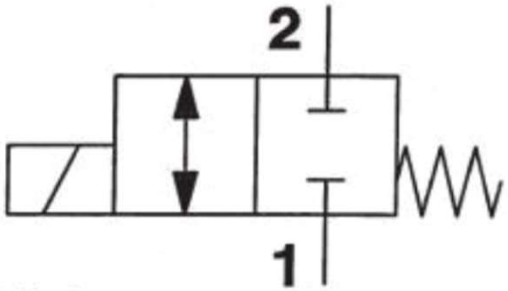
Valve Selection – Spool Valve





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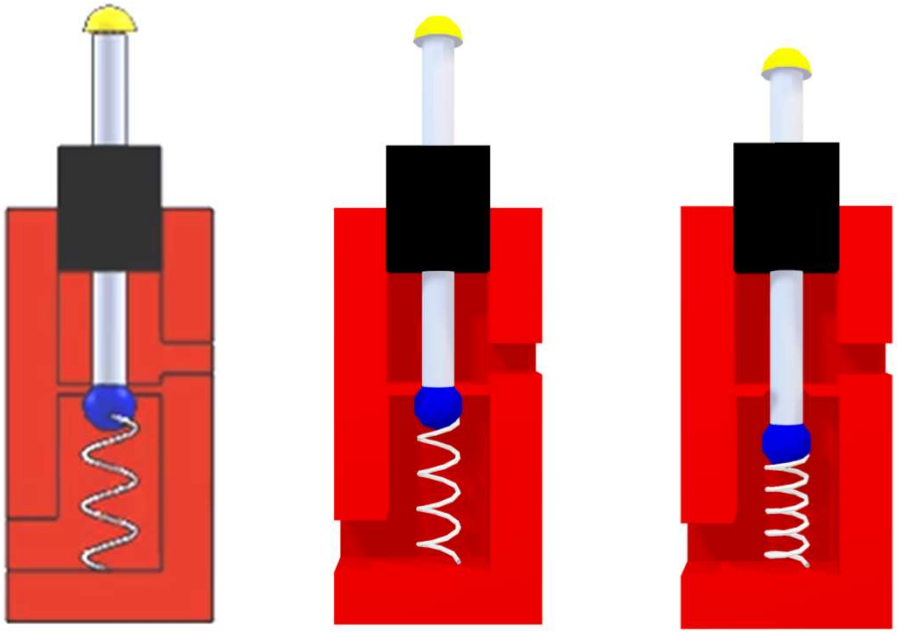
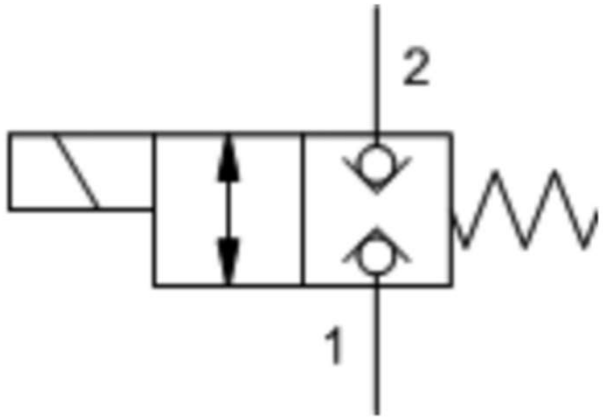
Valve Selection – Poppet Valve





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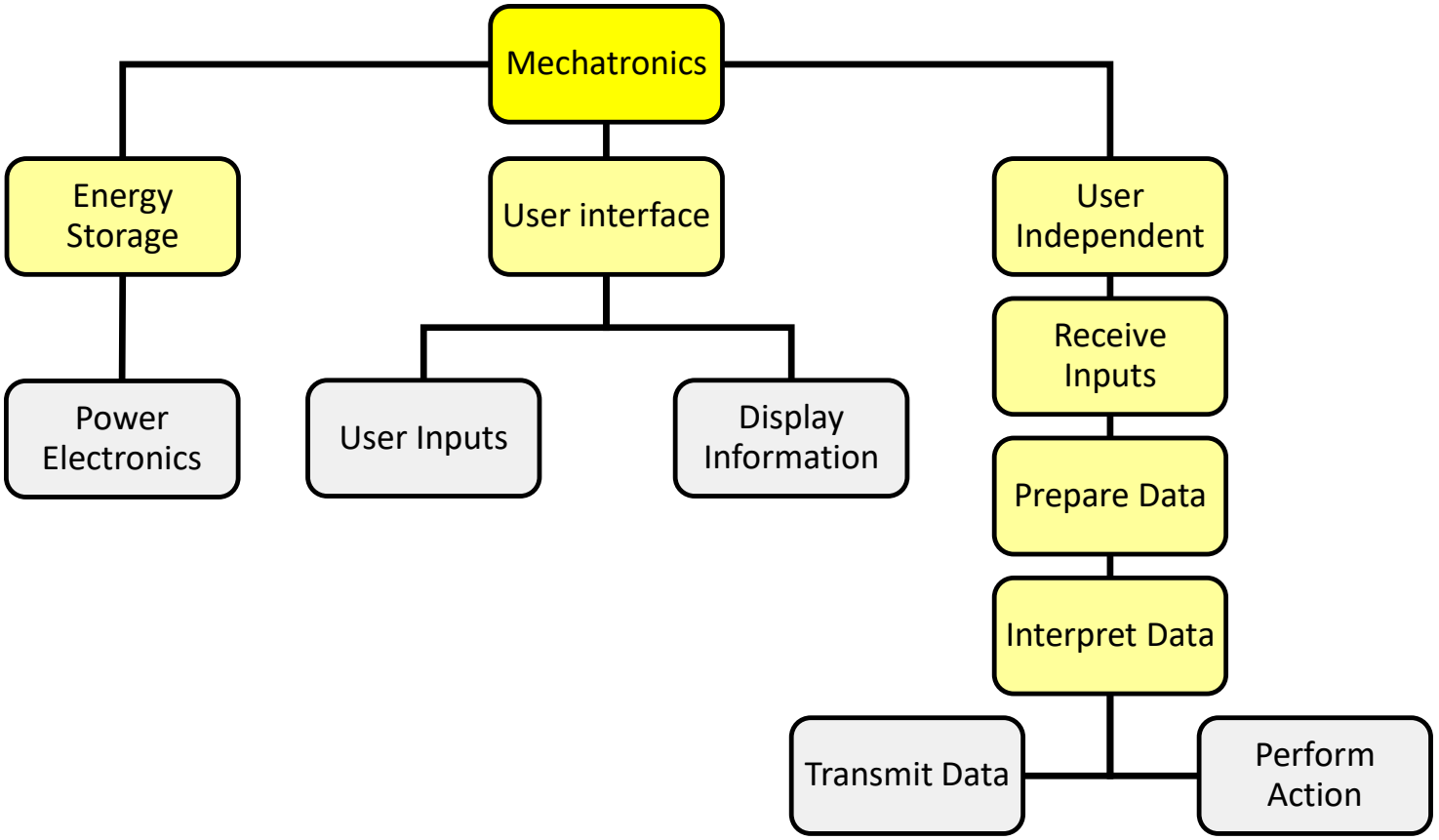
Mechatronics Functions



Adonay Almanza

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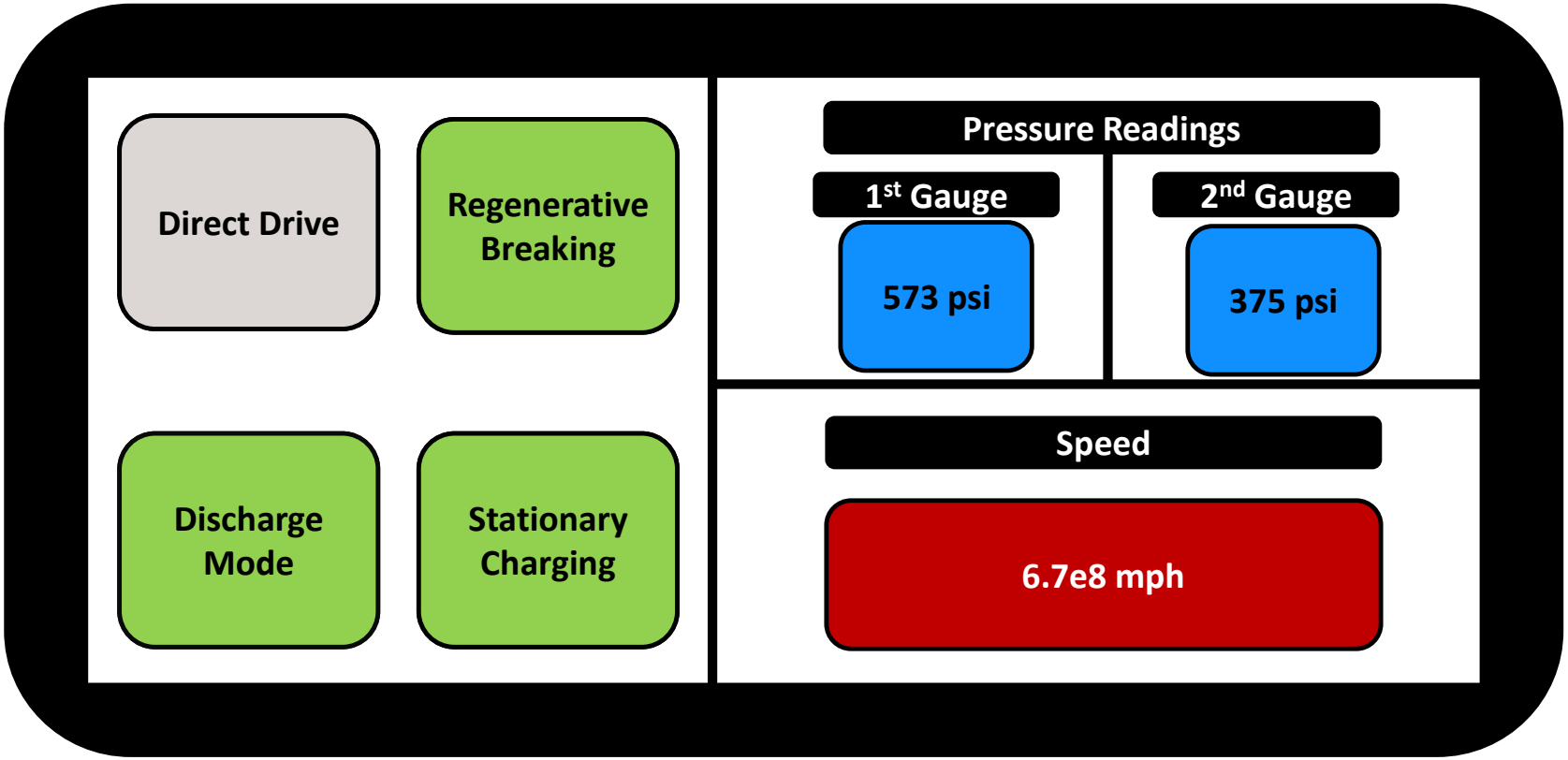
Adonay
Almanza

Display



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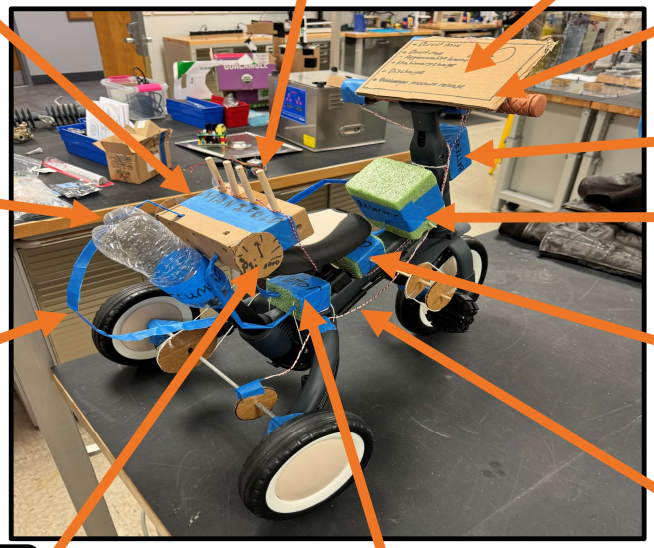
Prototype

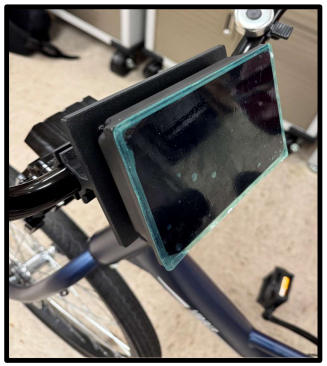


Adonay Almanza

Adonay
Almanza

Developments & Challenges

- Mount Motor & Pump
- Purchasing Hosing
- Mount Manifold
- Mount Accumulator



- Simulating in Animation Studio
- Microcontroller (PLC)
- Build Reservoir
- Frame Modifications

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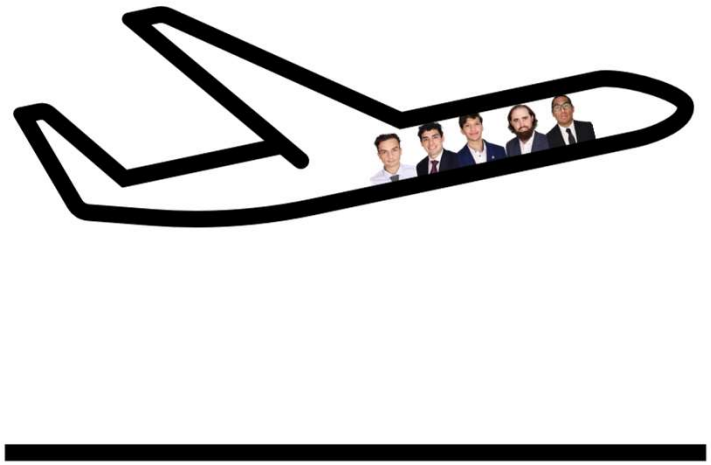
Final Competition



1:24 PM 2:00 PM 4:00 PM	Tuesday – April 22 Fly into Des Moines from Panama City Rent Car & Drive to Cedar Rapids Check into Hotel
8:00 AM 10:00 AM 12:00 PM 6:00 PM	Wednesday – April 23 Tour IFP Motion Solutions Drive to Ames Assemble bike, complete pre-race inspection Welcome Reception
8:30 AM 1:00 PM 4:30 PM	Thursday – April 24 Final Presentation & Design Review Races and Regenerative Braking Demonstration Networking Dinner
10:00 AM 12:00 PM 2:00 PM	Friday – April 25 Disassemble bike Award Ceremony Drive to Des Moines Airport

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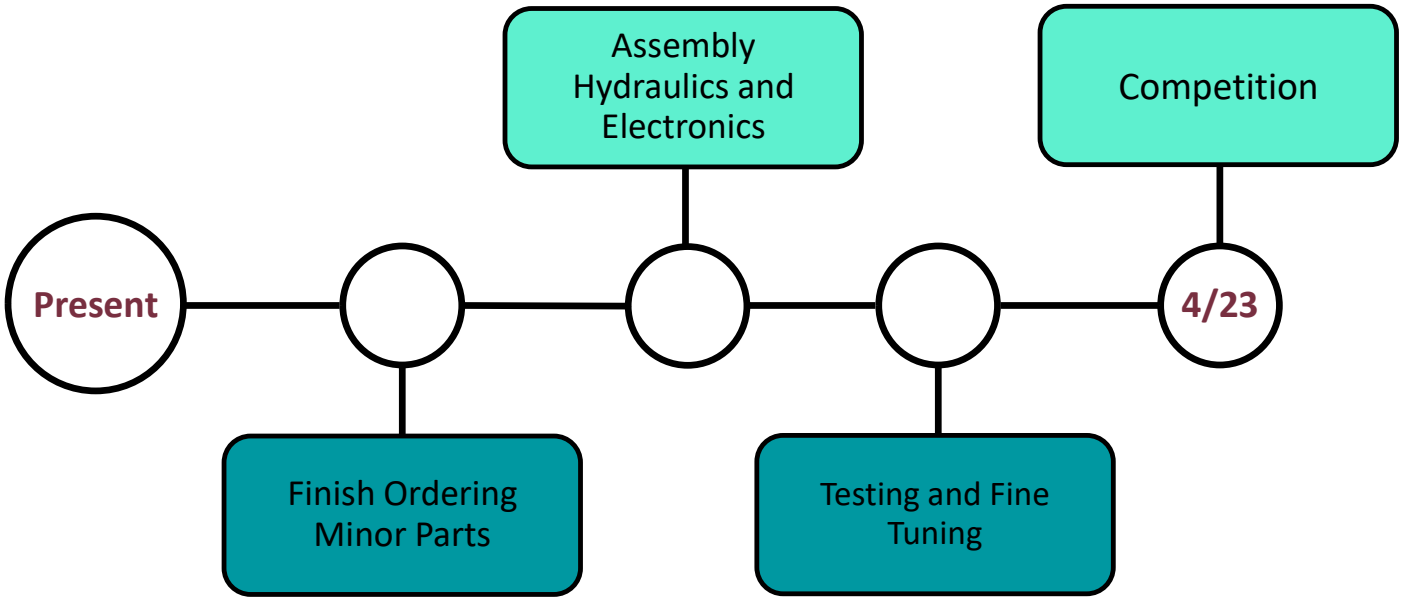
Future Work



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Almanza

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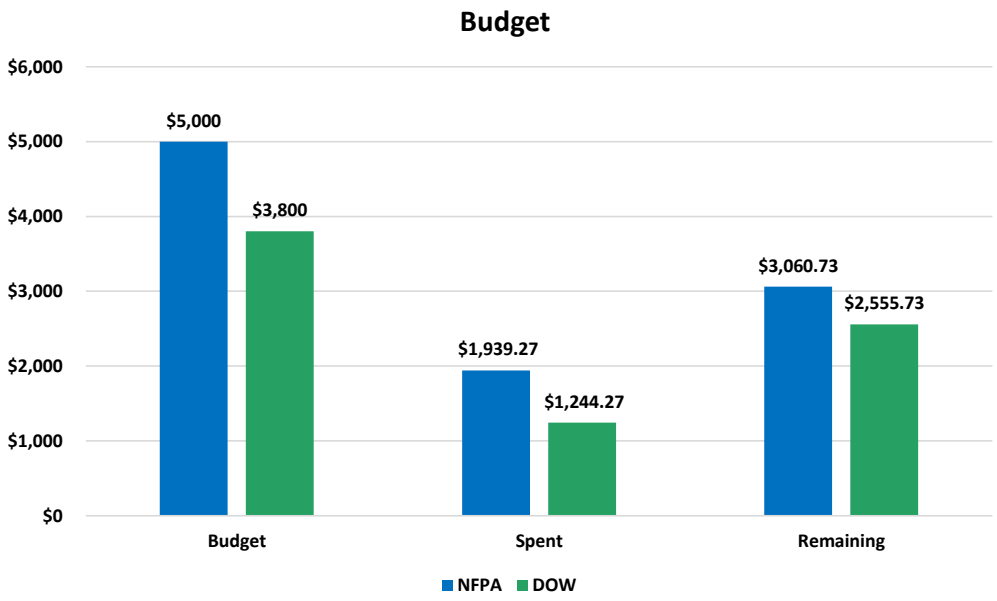
Budget



Expenses: $3183.54

- Bike: **$213.93**
- Brakes: **$54.99**
- Chain: **$51.60**
- Hotel: **$461.04**
- Travel & Meals: **$462.71**

- IFP Components: **$1745.27**
- SunSource Components: **$194**

Adonay Almanza

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Questions

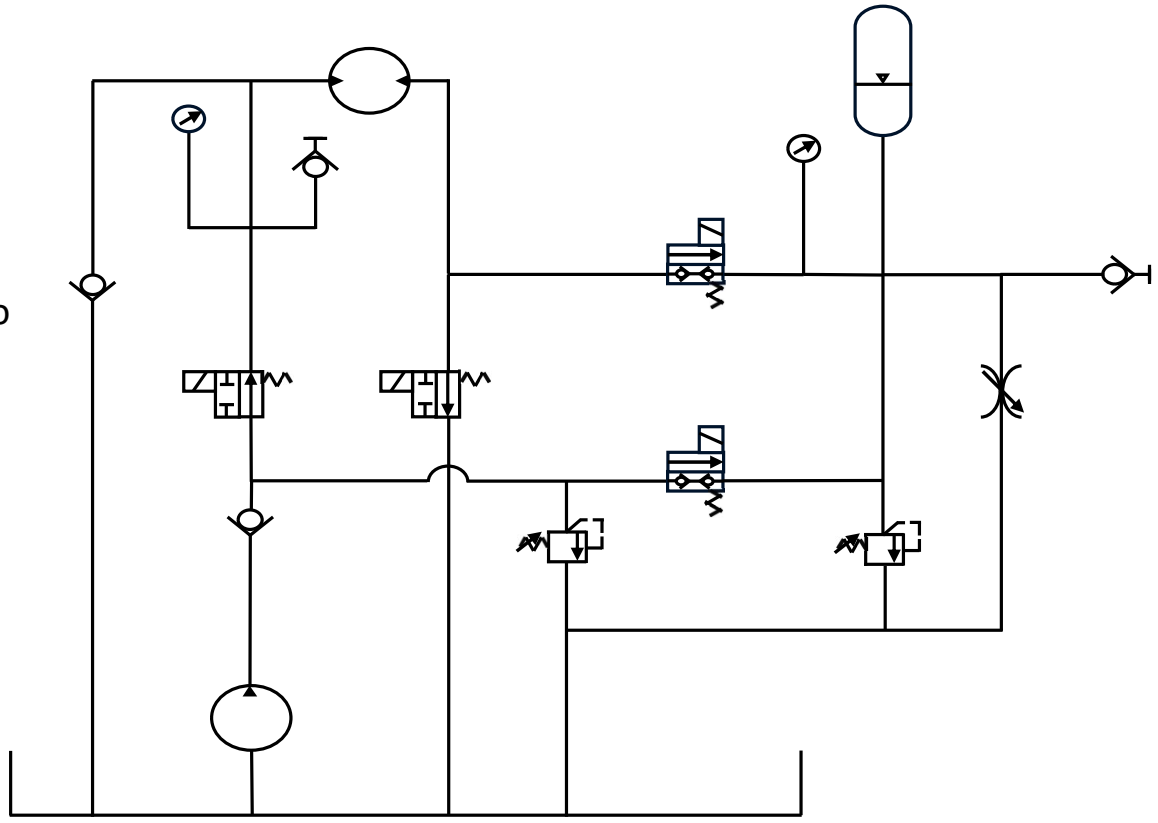
Adonay Almanza

Trace Flowers

Daniel Garmendia

Ethan Mercado

Gabriel Vazquez



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Almanza

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References

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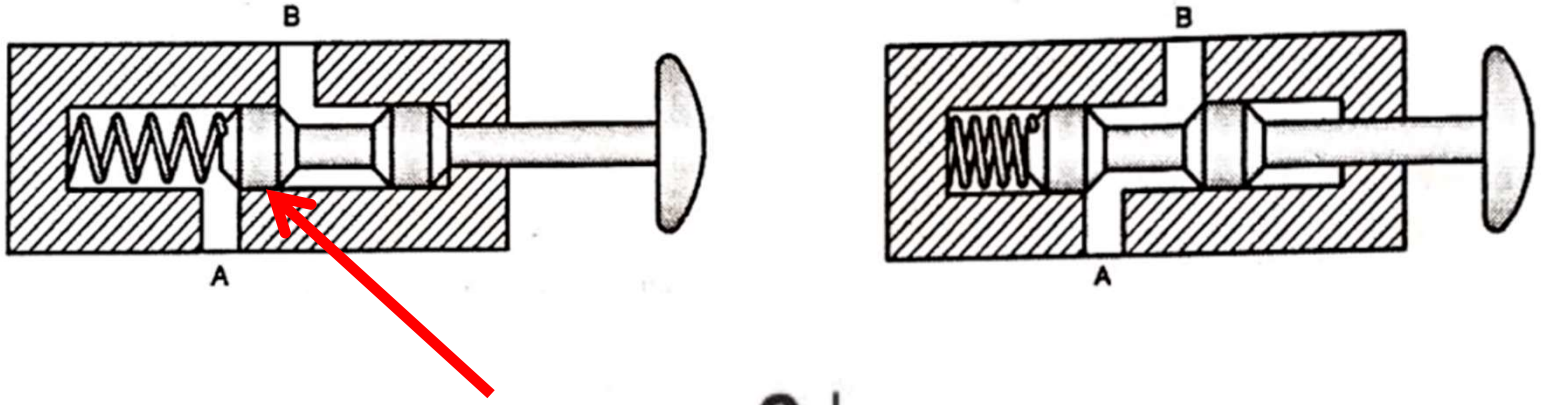
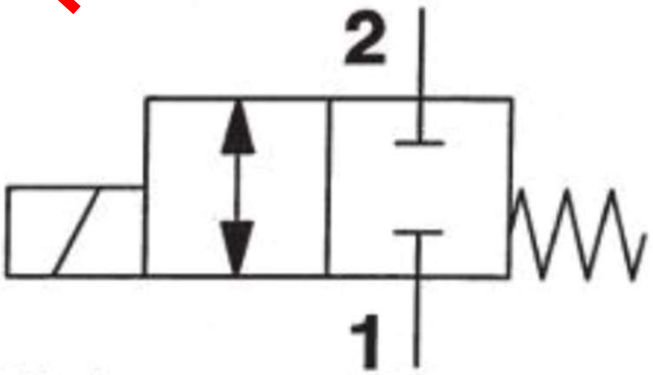
- Simplify Mechanical. “Ball Seat Poppet Valve Working Explained with Animation.” *YouTube*, YouTube, 7 May 2021, www.youtube.com/watch?v=QESe6rDrfX8.
- Torrey, J., Trujillo, A., Londono, K., & Chan, B. (2019). Fluid Power Vehicle Challenge: Final Design Review. California Polytechnic State University. Retrieved from Digital Commons Cal Poly: https://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1597&context=mesp
- Widmann, J., Gray, M., D'amour, R., Lopez, A. A., Ferrandino, C., & Dietz, J. (2024). Cal Poly Fluid Power Vehicle Challenge Final Design Review. California Polytechnic State University. Retrieved from Digital Commons Cal Poly: https://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1853&context=mesp

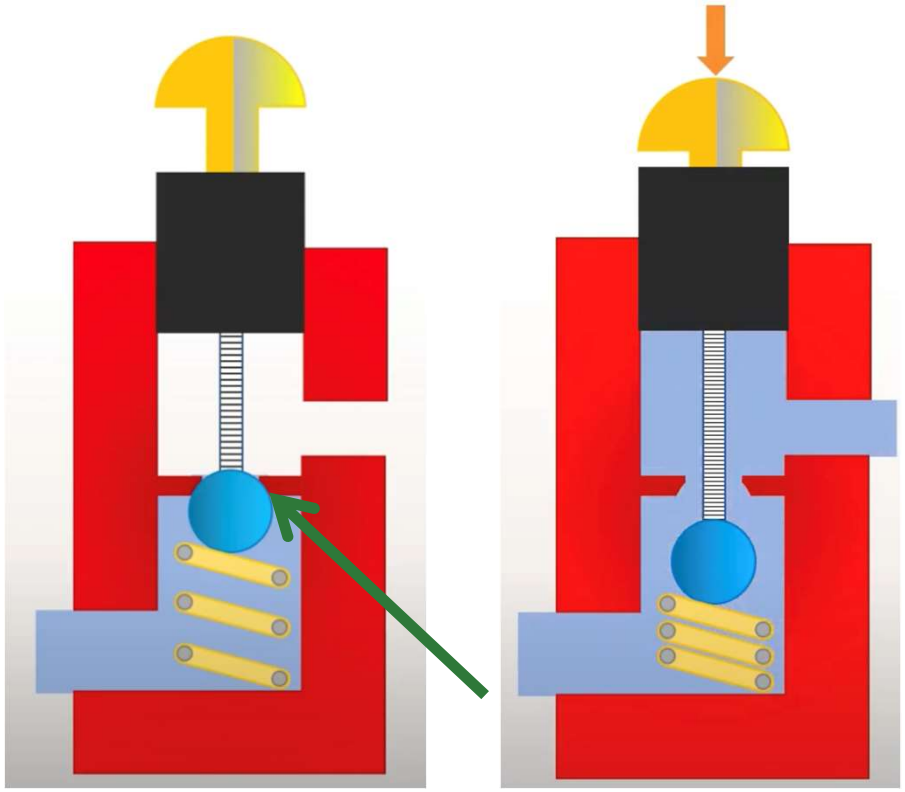
Adonay Almanza

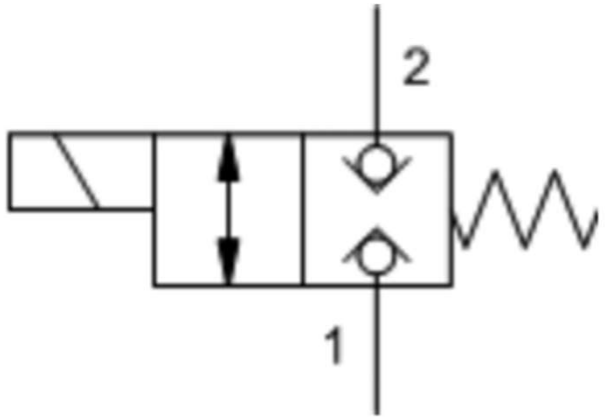
Valve Selection – Spool Valve





Valve Selection – Poppet Valve





Microcontroller

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Gabriel Vazquez

Midway Review Practice

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Back Up Slides

Slide Headline

- Try to keep text at 16 pt minimum.
- Try to put as few words as possible on the slide if you're using for a presentation.
- Mix and match the backgrounds as shown in this template or just use one throughout.
- You can put department/unit logos in slide master at Horizontal 0.89" Vertical 6.44" From top left corner

DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING | FAMU-FSU College of Engineering

DEPARTMENT OF INDUSTRIAL & MANUFACTURING ENGINEERING | FAMU-FSU College of Engineering

DEPARTMENT OF CHEMICAL & BIOMEDICAL ENGINEERING | FAMU-FSU College of Engineering

DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING | FAMU-FSU College of Engineering

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Font Check

- This is 10-point
- This is 15–point Times
- This is 20–point
- This is 25–point
- This is 30–point
- This is 35–point
- This is 40–point
- This is 50–point
- This is 60–point

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College of Engineering Color Palette

1 2 3

Pantone: PMS 195 C

RGB: 120, 47, 64
Hex: #782F40

Garnet

CMYK:19, 90, 50, 55

1 3 4

Pantone: Black C

RGB: 0, 0, 0
Hex: #000000

Black

CMYK:0, 0, 0, 100

1 2 4

RGB: 238, 118, 36
Hex: #EE7624

CMYK:2, 66, 99, 0

Fang Orange

2 3 4

Pantone: PMS 000C

RGB: 255, 255, 255
Hex: #FFFFFF

White

CMYK: 0, 0, 0, 0

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Accent Color Palette

RGB: 0, 59, 111
Hex: #003B6F

CMYK:

Tardis Blue

RGB: 251, 236, 93
Hex: #FBEC5D

CMYK:

Corn

RGB: 219, 215, 210
Hex: #DBD7D2

CMYK:

Timberwolf

RGB: 206, 0, 88
Hex: #CE0058

CMYK: 0, 100, 43, 12

Rubine Red

RGB: 104, 40, 96
Hex: #682860

CMYK:

Imperial

RGB: 220, 220, 220
Hex: #DCDCDC

CMYK:

Gainsboro

RGB: 72, 146, 155
Hex: #48929b

CMYK:

Asagi-iro

RGB: 64, 224, 208
Hex: #40E0D0

CMYK:

Turquoise

RGB: 255, 139, 0
Hex: #FF8B00

CMYK:

American Orange

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Analogous	F7AB19	D67F15	EE7624	D64615	F73119
Monochromatic	6E3610	F0A16C	EE7624	6E4931	BA5B1C
Triad	A14508	4BED3B	EE7624	250CED	2010A1
Complementary	A1470C	FF8C40	EE7624	0098A1	24E2ED
Split Complementary	28A164	2FED8D	EE7624	0848A1	1871ED
Double Split Complementary	EDAC2F	3BED93	EE7624	0C6AED	ED2F18
Square	ED660C	C7ED3B	EE7624	0CE1ED	A418ED
Compound	BA7E09	87724A	EE7624	60EFCF	09BA61
Shades	AD551A	6E3610	EE7624	FA7625	D46820

https://color.adobe.com/create/color-wheel

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Analogous	85412D	8F3831	782f40	8F3176	792D85
Monochromatic	C44D69	8E626D	782F40	C48796	451B25
Triad	C43959	78743B	782F40	236178	43A2C4
Complementary	C43959	C46078	782F40	25C43D	2F783A
Split Complementary	93C460	577835	782F40	39C49D	297861
Double Split Complementary	784435	5A783B	782F40	237860	6E2978
Square	782337	78683b	782F40	237830	293978
Compound	AB4D32	DEBAAF	782F40	5D8555	70AB32
Shades	38161E	C44D69	782F40	853447	5E2532

https://color.adobe.com/create/color-wheel

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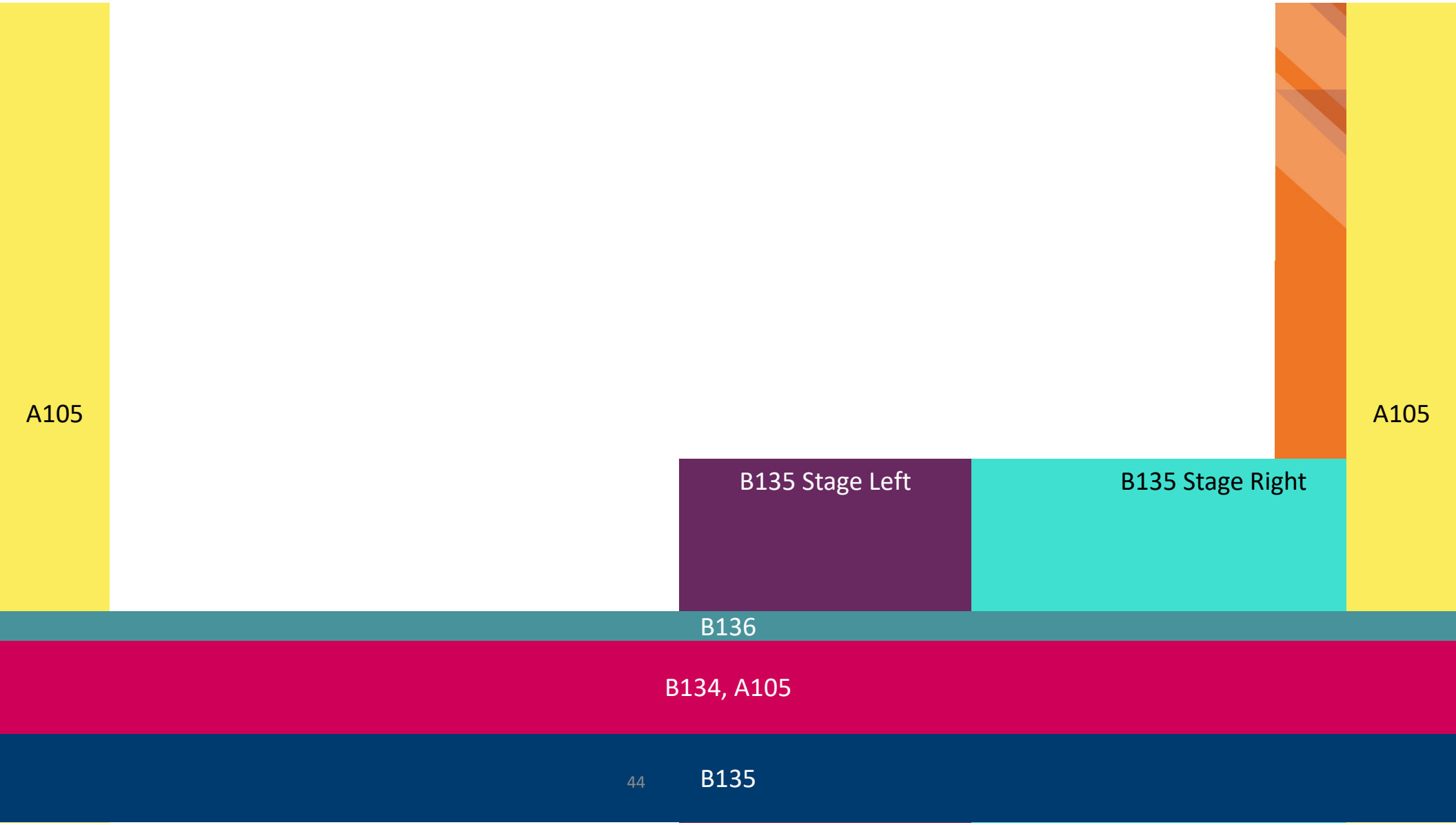
A105
B135 Stage Left
B135 Stage Right
A105
B136
B134, A105
B135

Border Line

Border Line

Center of White Space

Center of Slide

Border Line

Edge of Branding

Middle of Slide

Middle of White Space

Border Line

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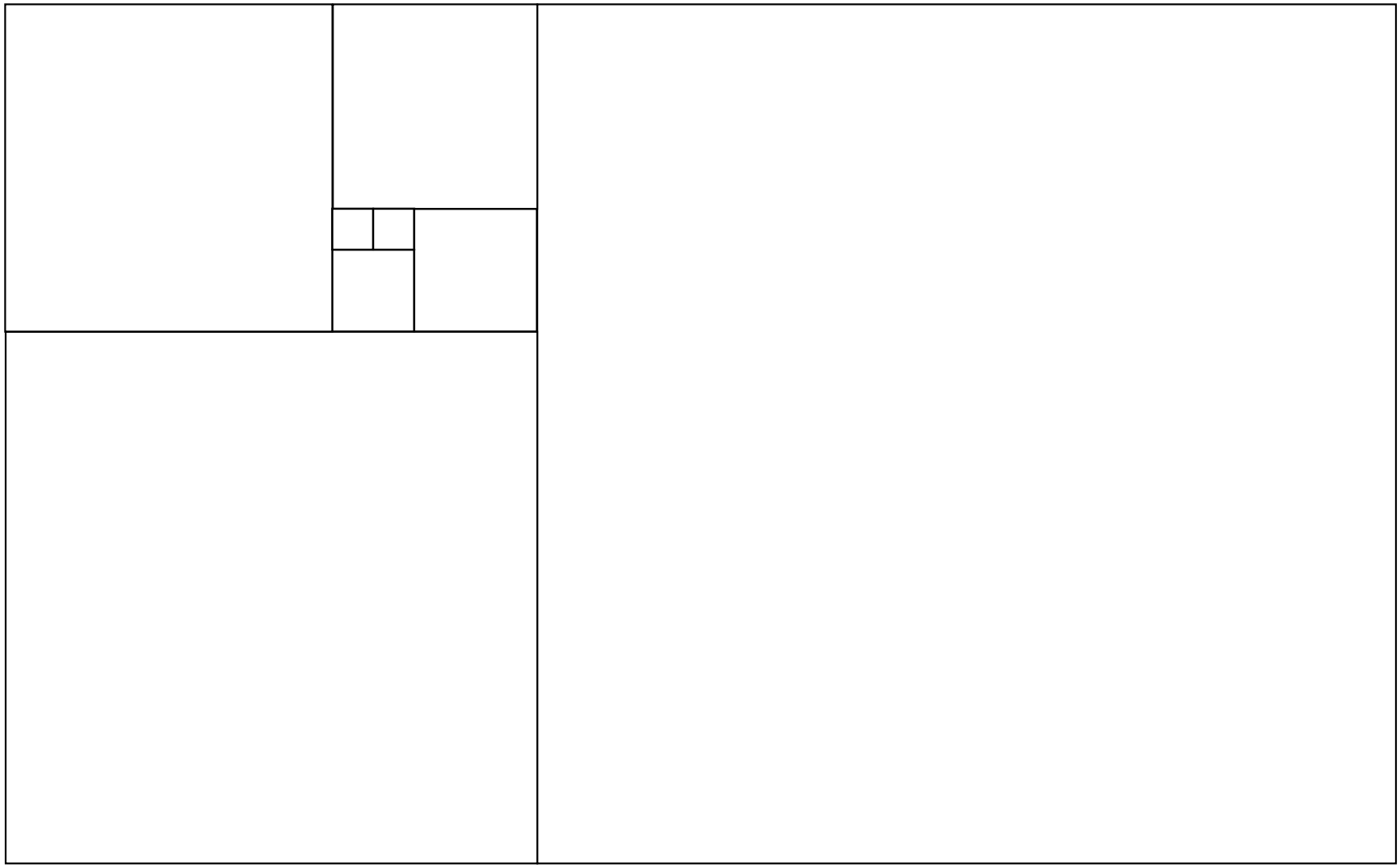

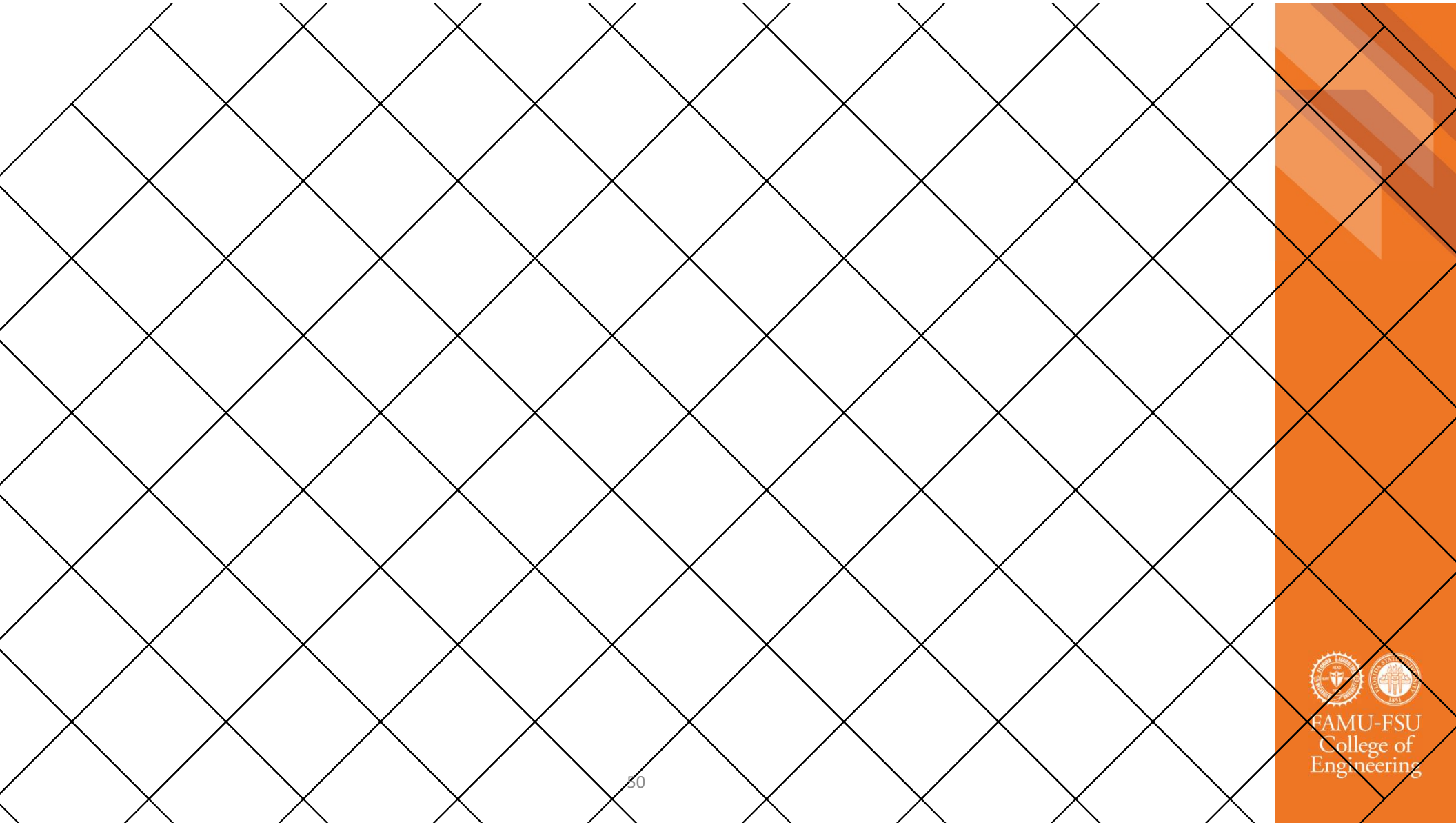

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