ELECTRIC BAJA 2019-2020

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THE PROJECT

- Transform 2015-2016 Baja Car to Full Electric
- Work along EE Capstone team
- Conform to E-Baja Safety Rules
- Compete against 2019 Baja Car
- Client is professor David Willy
- Financially sponsored by W.L. Gore

LITERATURE REVIEW

- BAJA SAE 2020
  - COMPETITION RULES THAT REGULAR BAJA TEAMS USE SUCH AS SCORING, SAFETY AND TECHNICAL REQUIREMENTS
  - SPECIFICATIONS ON ROLL CAGE, DRIVER HARNESS, SIGNALING
- BAJA SAE INDIA 2020
  - CONTAINS EXTRA E-BAJA SPECIFICATIONS FOR ELECTRICAL SYSTEMS
  - FURTHER DESCRIBES IDEAS TO PREPARE FOR IN PERFORMANCE

CHALMERS UNIVERSITY OF TECHNOLOGY, SWEDEN 2016

- DESIGN AND ASSESSMENT OF BATTERY ELECTRIC VEHICLE POWERTRAIN, WITH RESPECT TO PERFORMANCE, ENERGY CONSUMPTION AND ELECTRIC MOTOR THERMAL CAPABILITY

RESOURCES

- Machine Shop Training
  - Basic training for band saws, grinders, sanders, and drill press
  - Advanced training for weld, lathe, CNC, and mill
- Building 47A
  - Open space to home team and materials
- Electrical Engineering Team
  - Provide knowledge in electrical power systems and electronics
  - Access to resources such as battery bank and circuit materials

BACKGROUND

- ELECTRIC OFF-ROAD VEHICLES ARE QUIET
- COST SAVING (MUCH LESS EXPENSIVE THAN GASOLINE VEHICLES)
- BETTER FOR ENVIRONMENT

BENCHMARKING

Figure A

Figure B

BENCHMARKING

	Pros	Cons
Figure A	Low cost	Cheap material, Low speed Up to 40.39 m/h
Figure B	Higher speed Up to 60 m/h	Expensive

BENCHMARKING

	Brand/model	Transmission	Cost	Power	brakes
Figure A	AGY/ AG01	Auto 1 speed	$2800	5000w	Hydraulic
Figure B	EPIC Amp	Manual 3 speed	$17,900	14.4kw	Hydraulic

CUSTOMER NEEDS

Customer Needs	Customer Weights (5 Best to 1Least)
Safety	5
SAE India E-Baja Rules / Industry Standards	5
Suspension System	5
Brake Design	5
Electric Compatible Drive Terrain	4
New Gear Box	4
Battery Mount	3
Steering	3
Fabrication	2

High – 5
Low – 1

Engineering Requirements

Ranked according to relative technical importance:

1- Safety (Factor of Safety)

2- Speed (m/s)

3- Cost ($)

4- Torque (Nm)

5- Range of Motion (Degrees)

6- Weight (Newtons)

7- Power (Kw)

Budget

- Available Budget
  - Donation from Gore: $3,000
- Anticipated Budget
  - Steering: Tie Rods and Rack & Pinion - $300 - $500
  - Suspension: Front and Rear - $800 - $1,200
  - Brakes: $300 - $500
- Shop Budget: Tools - $1,110
- Budget is subject to change

THE TIMELINE

- MEETINGS WITH OUR CLIENT, DAVID WILLY, EVERY WEEK.
- RESEARCH ON BRAKES, FRONT & REAR SUSPENSIONS, STEERING, DRIVE TRAIN, AND FRAME.
- REBUILDING THE BAJA VEHICLE STARTING THIS SEMESTER AND CARRYING OVER TO NEXT SEMESTER.

	Task Name	Responsible	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16
1	**Meeting with Client (David Willy)**	All Members														
2	**Baja Research & Build**															
2.1	Brakes	Drew, Andres														
2.2	Front Suspension	Fahad, LeAlan														
2.3	Rear Suspension	Shamlan, Andres, Drew														
2.4	Steering	LeAlan, Fahad, Shamlan														
2.5	Drive Train	Drew, Fahad, Shamlan														
2.6	Frame	LeAlan, Andres														
3	**Meeting with Dr. Tester**															
3.1	Receive CAD of Baja	Drew														
3.2	Move Baja to Building 98C	All Members														
3.3	Take Measurements of Baja	All Members														
4	**Presentation 1**															
4.1	Project Description	Drew														
4.2	Background & Benchmarking	Fahad														
4.3	Literature Review	Andres														
4.4	Customer & Engineering Requirements	Shamlan														
4.5	Schedule & Budget	LeAlan														

THANK YOU!

QUESTIONS?

APPENDIX A

System QFD

Project:	E-BAJA
Date:	Sept. 16, 2019

Weight (N)	
Range of Motion (Degrees)	
Torque (Nm)	-
Cost ($)	
Power (KW)	- - -
Safety (n)	+ + -
Speed (m/s)	- -

			Technical Requirements						
	Customer Needs	Customer Weights (5 Best to 1 Least)	Weight (N)	Range of Motion (Degrees)	Torque (Nm)	Cost ($)	Power (KW)	Safety (n)	Speed (m/s)
1	Safety	5	3	9	1	3	3	9	9
2	SAE India E-Baja Rules / Industry Standards	5	3	3	9		3	9	
3	Battery Mount	3	3		1	1	1	1	
4	Electric Compitable Drive Terrain	4	3	3	9	9	9	9	9
5	Brake Design	5	3	3	3	3	3	9	3
6	New Gear Box	4	9	1	9	9	9	3	9
7	Fabrication	2	9	9	3	9	9	9	3
8	Suspension System	5	3	3	1	9		9	9
9	Steering	3	3	9	1	3		9	9
	Technical Requirement Units		Newtons	Degrees	Newton Meters	$	KW	Factor of Safety	m/s
	Technical Requirement Targets		TBD	TBD	TBD	3000	7.5	TBD	TBD
	Absolute Technical Importance		144	151	154	177	138	276	210
	Relative Technical Importance		6	5	4	3	7	1	2

APPENDIX B

	Task Name	Responsible	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16
1	**Meeting with Client (David Willy)**	All Members														
2	**Baja Research & Build**															
2.1	Brakes	Drew, Andres														
2.2	Front Suspension	Fahad, LeAlan														
2.3	Rear Suspension	Shamlan, Andres, Drew														
2.4	Steering	LeAlan, Fahad, Shamlan														
2.5	Drive Train	Drew, Fahad, Shamlan														
2.6	Frame	LeAlan, Andres														
3	**Meeting with Dr. Tester**															
3.1	Receive CAD of Baja	Drew														
3.2	Move Baja to Building 98C	All Members														
3.3	Take Measurements of Baja	All Members														
4	**Presentation 1**															
4.1	Project Description	Drew														
4.2	Background & Benchmarking	Fahad														
4.3	Literature Review	Andres														
4.4	Customer & Engineering Requirements	Shamlan														
4.5	Schedule & Budget	LeAlan														
5	**Peer Eval 1**	All Members														
6	**Self-Learning**	All Members														
7	**Presentation 2**	All Members														
8	**Preliminary Report**	All Members														
9	**Analyses Team Memo**	All Members														
10	**Peer Eval 2**	All Members														
11	**Website Check 1**	All Members														
12	**Presentation 3**	All Members														
13	**Final Report**	All Members														
14	**Peer Eval 3**	All Members														
15	**Final BOM/CAD Package**	All Members														
16	**Prototype Demo**	All Members														
17	**Final Prototype**	All Members														
18	**Website Check 2**	All Members														
19	**Analytical Report**	All Members														
20	**Peer Eval 4**	All Members														

APPENDIX C

REFERENCES

[1] "BAJA SAE INDINA 2020," *BAJA SAE INDIA RULES*, FEB. 2019.

[2] "BAJA SAE 2020," *COLLEGIATE DESIGN SERIES BAJA SAE RULES*, SEP. 2019.

[3] WWW.ALIBABA.COM. (2019). *AGY TWO SEATER GO KART BATTERY POWERED RACING BUGGY - BUY TWO SEATER GO KART,GO KART BATTERY POWERED,GO KART BUGGY RACING PRODUCT ON ALIBABA.COM*. [ONLINE] AVAILABLE AT: HTTPS://WWW.ALIBABA.COM/PRODUCT-DETAIL/AGY-TWO-SEATER-GO-KART-BATTERY_60814667941.HTML?SPM=A2700.7724857.MAIN07.23.35915C00SQJLBA.

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