Senior Design Team 519: Secure Fit Football Undershirt

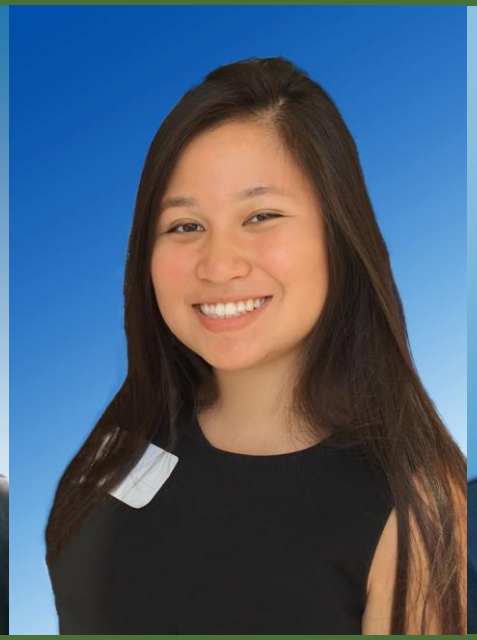
Paul Cunningham, Vivi Huynh, Sawyer O'Bryan,
Nicholas Palestrini, Morgan Sefcik

Paul Cunningham

Team Introduction

Morgan Sefcik
Project Manager

Paul Cunningham
Design and Materials Engineer



Vivi Huynh
Design and Manufacturing Engineer

Sawyer O'Bryan
Design and Materials Engineer

Nicholas Palestrini
Product Development and Data Engineer

Paul Cunningham

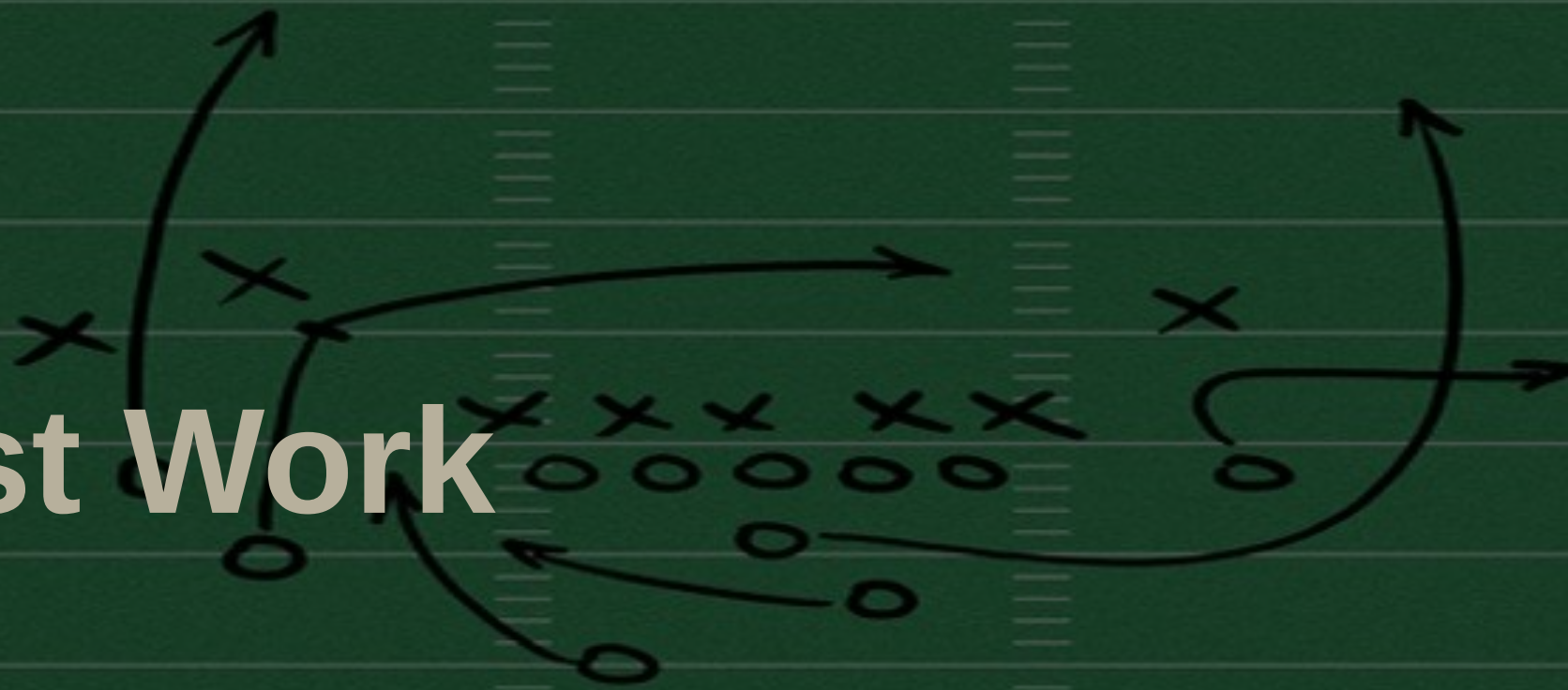
Sponsor and Advisor

Sponsor
Mike Holloway
Survivor 30th Season Winner

Academic Advisor
Christian Hubicki, Ph.D.
Assistant Professor

Paul Cunningham

Past Work



Paul Cunningham

Project Objective

The objective of this project is to reduce injuries of football players through the improvement of shoulder pads.

Paul Cunningham

Key Goals

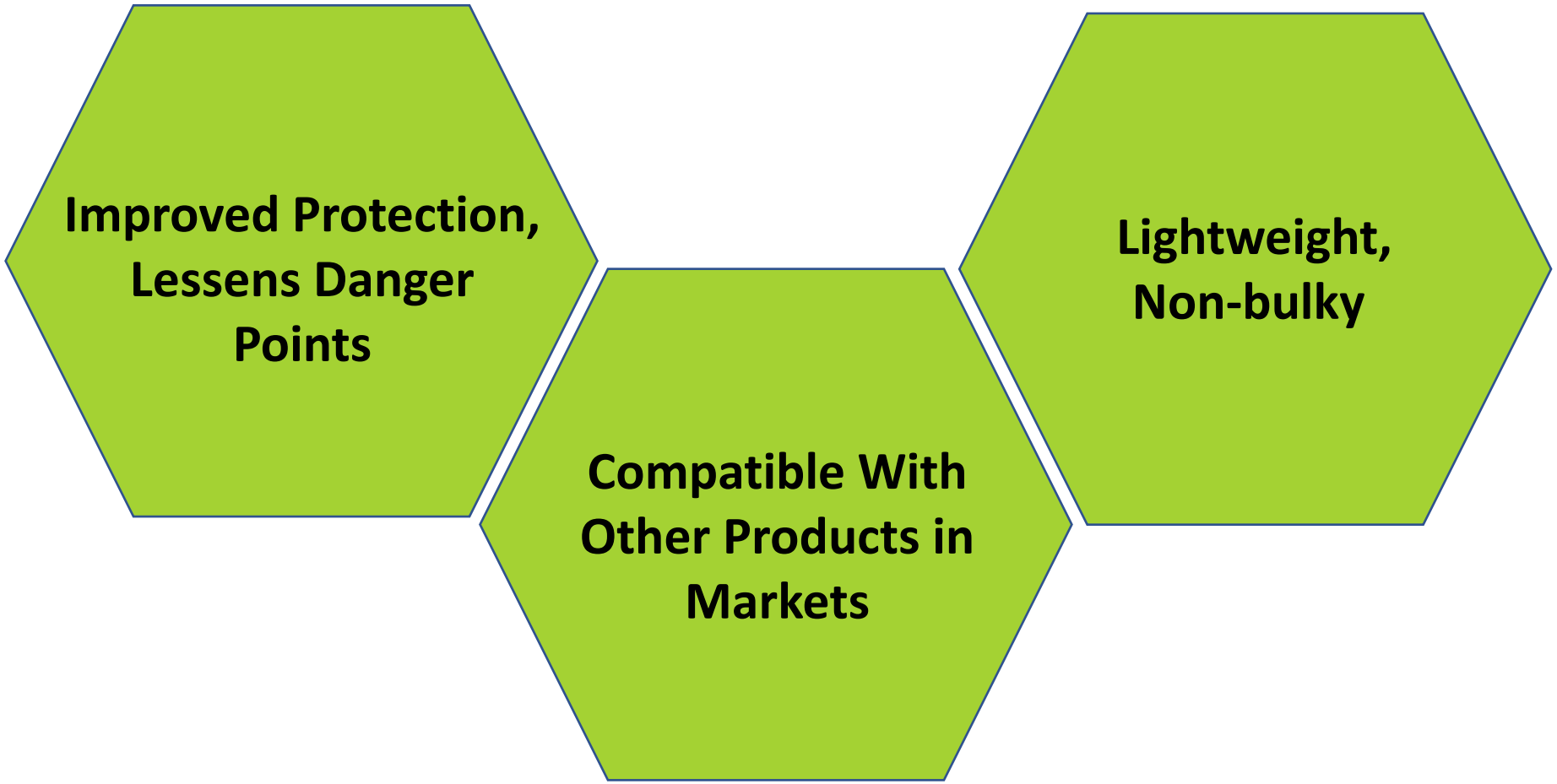
Optimal Fit

Lifespan and Durability

Prevent Restrictions of Movement

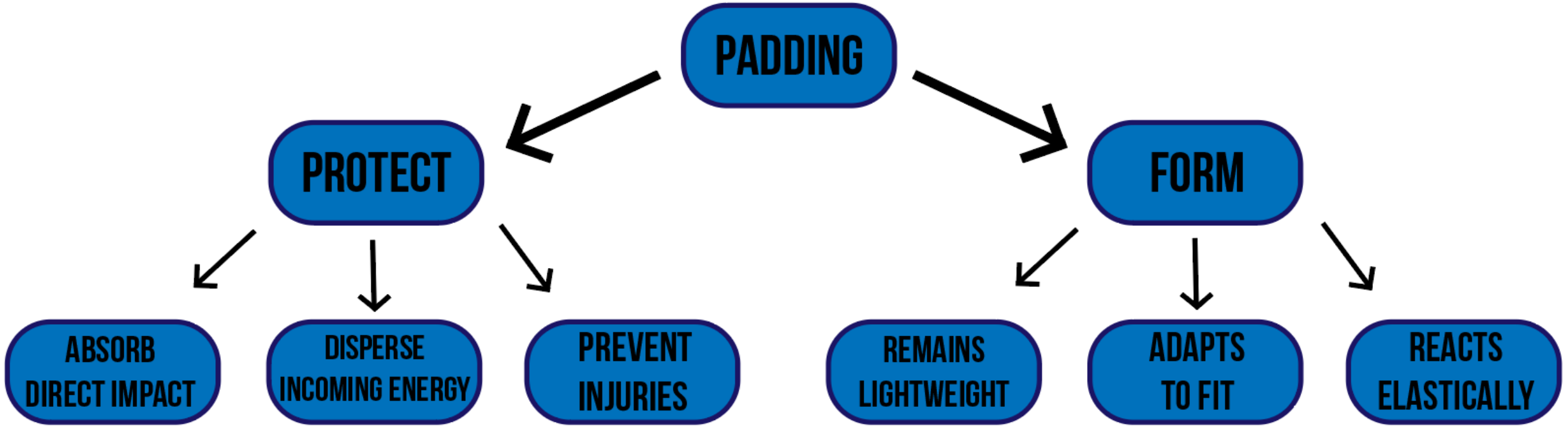
Paul Cunningham

Fundamental Needs



Paul Cunningham

Hierarchy Chart



Paul Cunningham

Cross-Reference Table

	Protect	Form
Absorb Direct Impact	X	
Disperse Incoming Energy	X	X
Prevent Injuries	X	
Remains Lightweight		X
Adapts to Fit	X	X
Reacts Elastically	X	X

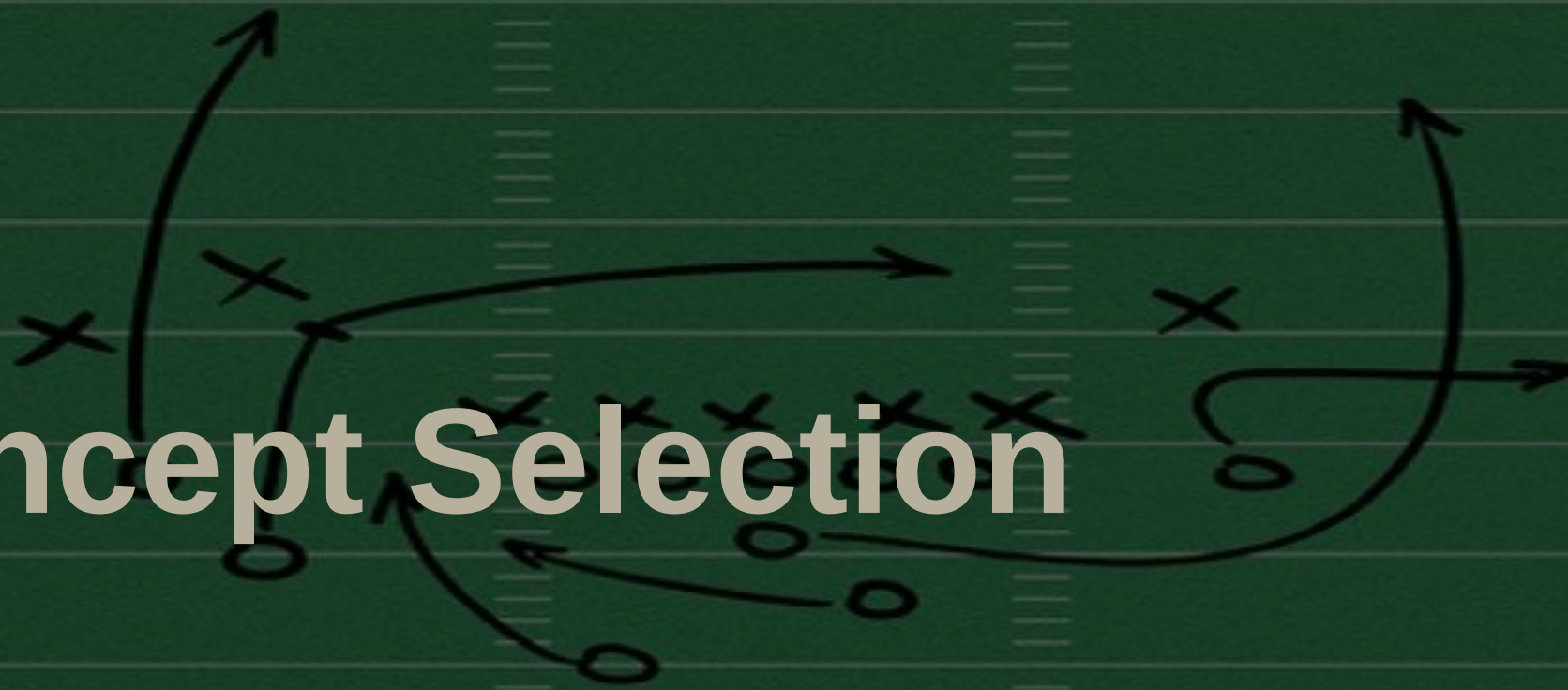
Paul Cunningham

Key Function Targets & Metrics

Function	Metric	Target
Adapts to Fit	Regulations (in)	½ in gaps, two finger width wiggle room
Disperse Incoming Energy	Force (lbf)	Less than 740 lbf
Reacts Elastically	Volume (in3)	No loss of volume

Paul Cunningham

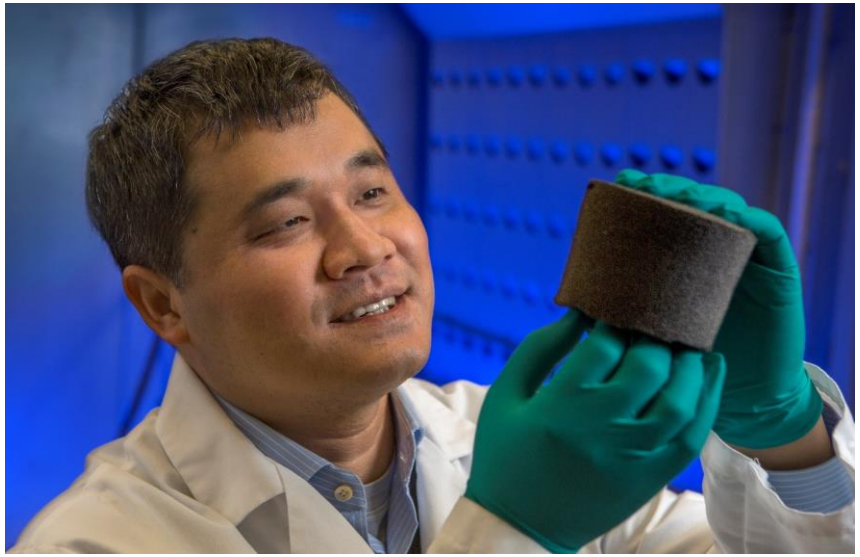
Concept Selection



Vivi Huynh

Original Selected Concept

Replace Interior Padding with Auxetic Foam



Dr. Zeng: Professor at FAMU-FSU College of Engineering

Vivi Huynh

Current Selected Concept

Secure Fit Undershirt

Vivi Huynh

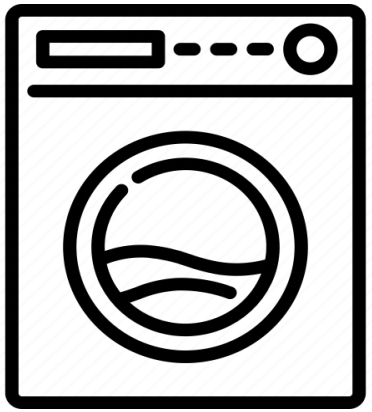
2021 Spring Semester

Vivi Huynh

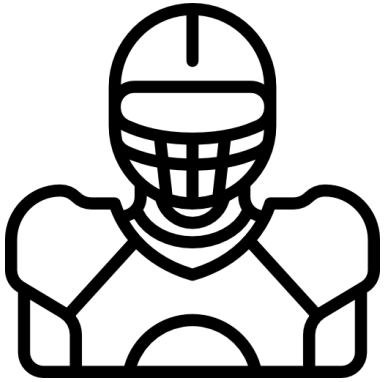
Methods of Validation : Testing

Feeler Gauge Test

Washing Cycle Test



Proof of Concept Test



Impact Test

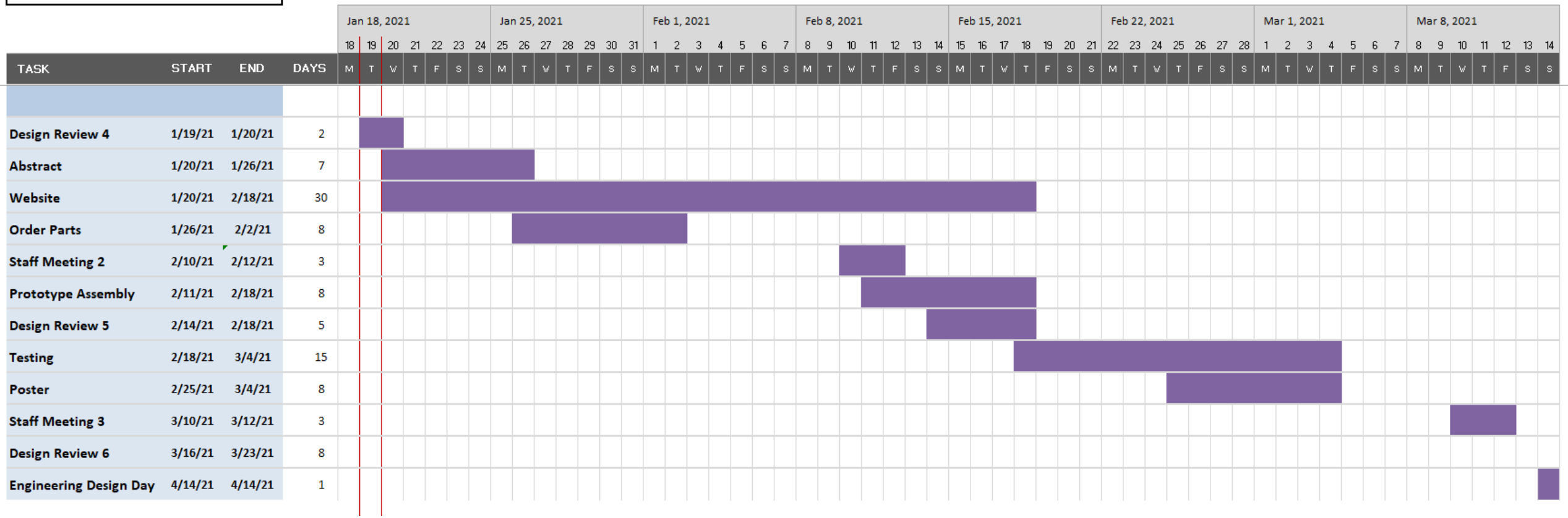
Air Dissipation Test

Vivi Huynh

Secure Fit Football Undershirt

GANTT CHART

Start Date Tue, 1/19/2021



TASK	START	END	DAYS
Design Review 4	1/19/21	1/20/21	2
Abstract	1/20/21	1/26/21	7
Website	1/20/21	2/18/21	30
Order Parts	1/26/21	2/2/21	8
Staff Meeting 2	2/10/21	2/12/21	3
Prototype Assembly	2/11/21	2/18/21	8
Design Review 5	2/14/21	2/18/21	5
Testing	2/18/21	3/4/21	15
Poster	2/25/21	3/4/21	8
Staff Meeting 3	3/10/21	3/12/21	3
Design Review 6	3/16/21	3/23/21	8
Engineering Design Day	4/14/21	4/14/21	1

Vivi Huynh

References

1. Crew, B. (n.d.). Physicists Might Have Just Solved The Mystery of Non-Newtonian Fluids. Retrieved November 06, 2020, from https://www.sciencealert.com/physicists-might-have-just-solved-the-mystery-of-non-newtonian-fluids
2. Elliott, P. W., PhD. (217). We're Working with Padding Manufacturers to Develop Safer Systems and Differentiate Products. Retrieved October 30, 2020, from http://asetservices.com/wp-content/uploads/2018/08/mat-pit-pad-introducton.pdf
3. Foam Products Company offers a variety of Open Cell and Closed Cell Foams that are made in the U.S.A. (n.d.). Retrieved November 06, 2020, from https://www.allfoam.com/index.html
4. NASA Technical Reports Server (NTRS). (n.d.). Retrieved October 30, 2020, from https://ntrs.nasa.gov/citations/20160006281
5. Schutt Air XP Pro Q10 Football Helmet. (n.d.). Retrieved November 06, 2020, from https://www.schuttsports.com/air-xp-pro-q10-football-helmet.html
6. Vinoski, J. (2019, May 29). Guarding Against Concussions: Startup Auxadyne Makes Ultra-Cushioning Foam For Helmets, Prosthetics. Retrieved November 06, 2020, from https://www.forbes.com/sites/jimvinoski/2019/05/24/auxadynes-foam-padding-might-just-save-your-head-and-other-parts-too/?sh=2f8c15853969
7. Broekaart, D. Foam Indentation with Abaqus FEA. Retrieved November 06, 2020, from https://info.simuleon.com/blog/foam-indentation-with-abaqus-fea

Vivi Huynh

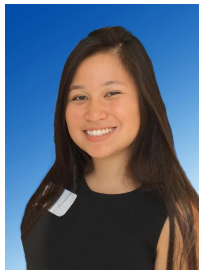
Contact Information

Paul Cunningham
Email: pmcham22@gmail.com
Cell: +1 (850) 556-0917
LinkedIn: https://qrgo.page.link/YFhgd

Sawyer O'Bryan
Email: sawyerobryan333@gmail.com
Cell: +1 (850) 557-3995
LinkedIn: https://qrgo.page.link/NxotS

Nicholas Palestrini
Email: nick.palestrini@gmail.com
Cell: +1 (813) 716-6292
LinkedIn: https://qrgo.page.link/tJnXR

Morgan Sefcik
Email: morgansefcik@gmail.com
Cell: +1 (904) 718-4838
LinkedIn: https://qrgo.page.link/EfpbR



Vivi Huynh
Email: vivi.huynh@outlook.com
Cell: +1 (850) 341-6531
LinkedIn: https://qrgo.page.link/wmcnz

Vivi Huynh

Consistency Check		
{Ws}	{W}	Cons
3.78	0.502	7.54
1.19	0.168	7.09
0.67	0.104	6.45
0.91	0.143	6.40
0.25	0.041	6.18
0.27	0.043	6.35
Average (λ)		6.67

Consistency Comparison	
λ - n	0.67
n - 1	5
Consistency index	0.133
RI Value	1.35
Consistency Ratio	0.099