ENGINEERING
VIRGINIA TECH

Joseph F. Ware, Jr. Advanced Engineering Lab

Annual Report | 2019-2020

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Executive Summary

This facility report summarizes activities at Virginia Tech's *Joseph F. Ware, Jr. Advanced Engineering Lab* housed in the College of Engineering for academic year 2019-20. The report includes sections on lab expenditures, student demographics, outreach activities, and the Ware Lab COVID 19 response. This year over 500 Virginia Tech students completed the general survey but due to COVID 19 students were not permitted in the facility after March 16. All regional and international competition events were canceled, as well.

Total lab expenditures for maintenance and repair of the Ford F350 and the GMC Sierra trucks were $8616. Total trailer expenditures were $8692 including $6900 for the addition of a new wrap for the gooseneck trailer. The wrap's costs were recovered via an award from the SEC (*Student Engineers' Council*). Equipment and material expenditures totaled $23,100 including $6985 for a new portable welder and $3640 for electrical upgrades in the Formula, BOLT, and HPS project bays. The grand total for all expenditures for 2019-20 was $33,510 adjusting for the SEC contribution.

Additionally, this report has information on Ware Lab's participation in STEAM 2019 in Roanoke, Virginia, and Lockheed Martin's contribution to six of our teams. More details on lab operations are available from the Ware Lab/AEDL manager, Dewey Spangler (spanger@vt.edu).

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Introduction

The Joseph F Ware, Jr. Advanced Engineering Lab at Virginia Tech (aka *Ware Lab*) is an undergraduate design facility housed within Virginia Tech's College of Engineering in the Military Building on the main campus. The facility is home to ten undergraduate teams from various departments within the college. Ware Lab staff consists of:

- Dr. Bev Watford, PE - Director
- Dewey Spangler, PE - Manager
- Phil Ratcliff - Assistant Manager
- Jennifer Stone – COE/Ware Lab Purchasing Agent

The Ware Lab spans over of 10,000 square feet of space divided into four main areas. Each area requires varying levels of safety certification as specified in the *Ware Lab General Policy Manual*. These areas include:

1. General Areas
    a) First floor – (Room 100, 104, 106 through 114, 117) – Fig. 1.
    b) Basement – (Room 18) – Fig. 2.
2. Machine Shop – (Room 101) – Fig. 1.
3. Welding Shop – (Room 102) – Fig. 1.
4. Administrative Areas – (Room 101A, 101AA, 103, 105) - Fig. 1

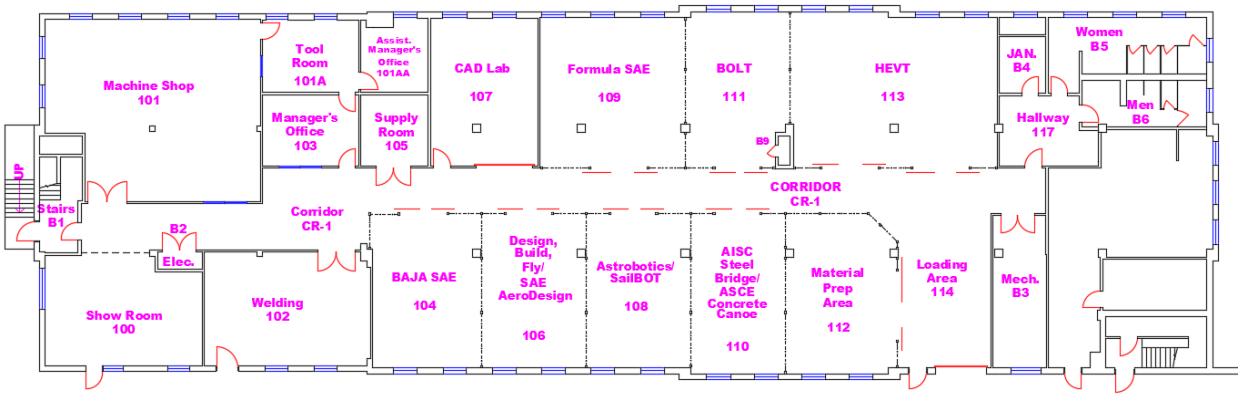

Figure 1 – Ware Lab Main Floor.

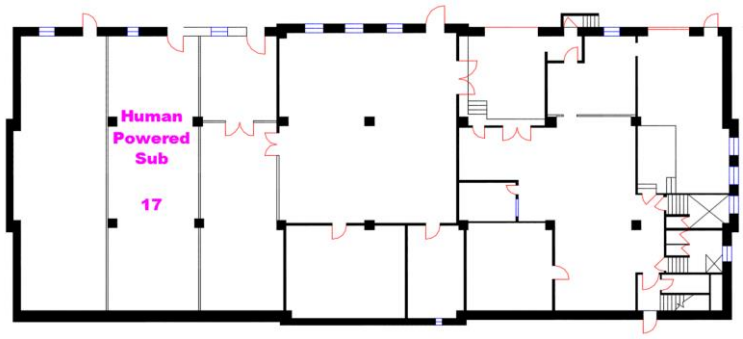

Figure 2 – Ware Lab Basement.

Student and Faculty Membership

511 students from various academic departments completed the Ware Lab general survey prior to the facility closing on March 16 due to COVID 19. Table 1 is a list of Ware Lab faculty advisors. Table 2 is a list of team leadership. Appendix D has a comprehensive list of all student team members for 2019-20.

Table 1 – Ware Lab Team Links and Faculty Advisors for 2019-20

Ware Lab Team	Faculty Advisor	Academic Department
Astrobotics	Alex Leonessa	Mechanical Engineering
Baja SAE	Rick Clark	Mechanical Engineering
BOLT	Rick Clark	Mechanical Engineering
BOLT	Author Ball	Electrical and Computer Engineering
Concrete Canoe	David Mokarem	Civil and Environmental Engineering
Design Build Fly	Rakesh Kapania	Aerospace and Ocean Engineering
Formula SAE	Matt Rice	Mechanical Engineering
Hybrid Electric Vehicle	Doug Nelson	Mechanical Engineering
Human Powered Sub	Christine Gilbert	Aerospace and Ocean Engineering
SailBOT	Stefano Brizzolara	Aerospace and Ocean Engineering
Steel Bridge Team	Matt Hebdon	Civil and Environmental Engineering

Table 2 – Ware Lab Team Leads for 2019-20

Ware Lab Team	Team Lead	Role
Design Build Fly (DBF)	Shreya Chandramouli	Aerodynamics, CFD, Structures
DBF	Michael Deitch	Propulsion, Electronics
DBF	Taylor Ransford	Manufacturing
DBF	Ryan Fisher	Stability, Control
DBF	Jeffrey Nolte	Systems
DBF	Jack Barns	SEC Rep and Outreach
DBF	David Shane	Chief Engineer
DBF	Avery Sebolt	Project Manager
Steel Bridge Team (SBT)	Adam Caretti	Co-Captain
SBT	John Zeglanski	Co-Captain
Concrete Canoe Team (CCT)	Jessica Viehman	Co-Team Lead
CCT	Nic Bulzoni	Co-Team Lead
CCT	Andrew Williams	Co-Team Lead
CCT	Zach Hill	Co-Team Lead
CCT	Megan Beever	Co-Team Lead
Astrobotics	Grant Anderson	Team Lead
Baja SAE	Jeff Stout	Team President
Baja SAE	John Gilleran	Chief Engineer
Baja SAE	Melanie Do	VP of Finance
Baja SAE	Josh Jones	VP of Outreach
Baja SAE	Hunter Clark	VP of Operations
BOLT	Grayson Richmond	Co-Team Lead
BOLT	Heather Hawley	Co-Team Lead
BOLT	Jason Chandler	Chassis Lead
BOLT	Will Campbell	Controls Lead

BOLT	Nick Stamps	Powertrain Lead
Formula SAE (FSAE)	Andrew Fall	Team Lead
FSAE	Bryden Tutko	Manufacturing Lead
FSAE	Nolan McGrady	EV sub team
FSAE	Kenneth Lin	EV sub team lead
FSAE	Josh Kintz	Team Lead for 2021
Human Powered Sub (HPS)	Matt Criss	President
HPS	Gillian Hersh	Vice President
HPS	Paul Rossi	Head of Design
HPS	Pete Gioia	Treasurer
HPS	James Duval	Sponsor Relations
HPS	Daniel Alex	Event Coordinator
Hybrid Electric Vehicle Team (HEVT)	Dan Harvey	Project Manager
HEVT	Christian Tollefson	Engineering Manager - Team Lead
HEVT	Clayton Mangette	Connected and Automated Vehicles Manager
HEVT	Rishit Modi	Propulsion Systems Integration Manager
HEVT	Thomas Legg	Controls Manager
HEVT	Tyler Krusen	PSI Co-lead
HEVT	Tom O'Shea	PSI Co-lead
HEVT	Tom Tase	CAVs Lead
HEVT	Jacob Levin	Communications
SailBOT	Blasé Cornett	Team Lead

Ware Lab COVID 19 Response

COVID 19 Standard of Operation

On March 16 Ware Lab was closed to all students and faculty due to COVID 19. On August 3 teams were allowed to return to the lab under limitations as mandated by the governor of Virginia. In order to accommodate students returning to campus a lab planning tool is now in effect. The planning tool indicates the maximum number and placement of students in various project bays and common areas to conform with personal distancing rules (Table 3). This document also indicates that masks must be warn at all times while in the Ware Lab facility. Copies of the planning tool are available from Ware Lab/AEDL management at spangler@vt.edu. Figures indicating correct personal distancing per bay and common area are shown in Appendix A.

Table 3 – COVID 19 Project Bay/Common Area Student Capacities

Ware Lab Team/Common Area	Room Number	Capacity	Figure (Appx. A)
CAD Lab	107	6	A1
Formula SAE	109	5	A2
BOLT	111	5	A3
HEVT	113	8	A4
Material Prep	114	4	A5
Steel Bridge	110	5	A6
Astrobotics/SailBOT	108	5	A7
DBF	106	4	A8
Baja SAE	104	5	A9
Weld Shop	102	5	A10
Machine Shop	101	7	A11
Human Powered Sub	16	7	A12
Showroom	100	5	A13
	Total:	**65**	

Figure 3 shows placement of clear partitions (green lines) and student team member locations for 3’ x 6’ and 4’ x 8’ work tables. Red circles are 6’-6” in diameter to maintain 6’-0” nose-to-nose distances.

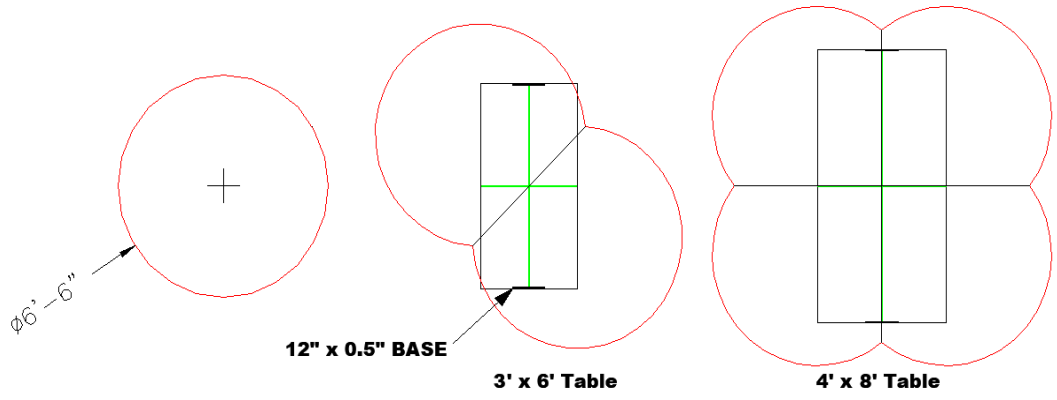

Figure 3 – Partition and personal-distancing layout for 3’ x 6’ and 4’ x 8’ team work tables.

Additionally, all teams must submit a signed copy of the *Ware Lab Standard Operating Plan* (SOP– Appendix B) to the lab manager. The first page of the SOP must be displayed on the team's cage wall, visible from the hallway. This SOP has details on:

- Surface disinfection,
- Social distancing,
- Use of masks and gloves,
- Daily best practices, and
- Prohibitions against occupancy

Plexiglass Construction

In partnership with the ISE Lab in Virginia Tech's Industrial Engineering Department, Ware Lab assistant manager Phillip Ratcliff built seven clear plexiglass partitions that were placed at various locations in the facility (Figures 4 and 5). Costs associated with each 4' x 8' partitions were between $50 to $60 representing a significant savings compared to purchasing partitions from local and online vendors.

Figure 4 – Plexiglass partitions during construction (left), CAD lab partition placement (right).

Figure 5 – Plexiglass partitions: assistant manager's office (left), manager's office (right).

Mask and Respirator Production for VT/Carilion School of Medicine

Working with the Virginia Tech Carilion School of Medicine and Virginia Tech's DREAMS Lab, Ware Lab helped address the shortage of face masks and portable respirators during the early stages of the COVID 19 pandemic. Assistant manager Phillip Ratcliff and former Baja team lead Genevieve Gural performed final surface finishing to masks (Figure 6, left) and respirators (Figure 6, right) produced on 3D printers housed in the Dreams Lab facility. Masks and respirators were distributed to Roanoke for use by medical school professionals and patients.

Figure 6 – Face mask (left) and respirator components surface finished at Ware Lab for VT Carilion in Roanoke.

Machine Shop Training Video

As students return to Ware Lab for fall semester, many will require machine shop training in order to obtain safety certification. In the past, this required completion of a three-hour face-to-face orientation with the assistant manager along with part production on in-house lathe and milling equipment. Due to new personal distancing requirements the first hour of machine shop orientation will be delivered by an online video produced by Virginia Tech's outreach department (Figure 7). Once students watch the video a face-to-face meeting with the lab assistant manager will complete the orientation. Live meeting will be limited to two students and the instructor.

Figure 7 – Phillip Ratcliff (left) and Spencer Roberts during production of machine shop training video.

Ware Lab Promotional Video

Each year the Joseph F. Ware Advanced Engineering Lab hosts summer camps for tours of its facility. These groups include *CTech^2, CEED, NASA Inspire* and *4H*. Camp participants learn a lot and many decide to attend Virginia Tech to join a Ware Lab team. In the same spirit, Ware Lab planned to host summer camps this year but was unable due to COVID 19. To provide an option for visitors a Ware Lab video was produced by the COE that feature lab faculty advisors *Rich Clark*, *Christine Gilbert*, and *Matt Rice*, lab assistant manager *Phillip Ratcliff*, and lab manager *Dewey Spangler*. The video is posted on the lab website and as of August has received 254 views on YouTube. A new edition of the video is planned for Fall 2020 to include student interviews and will be featured at the 2020 Roanoke STEAM (*Science, Technology, Engineering, Arts, Math*) virtual event to be help on October 23rd.

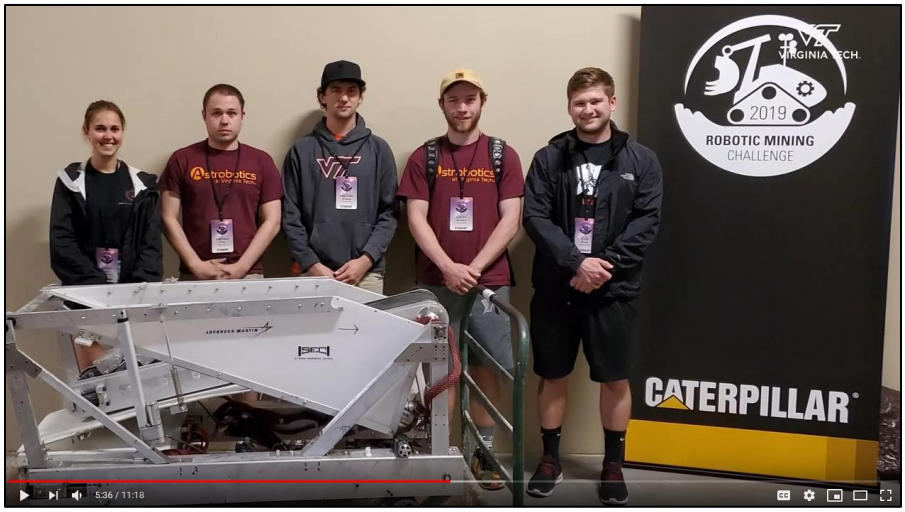

Figure 8 – Ware Lab Promotional Video.

New Ware Lab Equipment

In 2019 Ware Lab acquired a new Dynasty 210 Miller TIG portable welder (Figure 9) to be use by teams performing hot-work in individual bay areas and at competition events. Students receive extensive training in proper hot-work procedures prior to using welding equipment. Baja SAE and Formula SAE weld complex 3D steel chassis frames for their vehicles each year. Steel Bridge welds a modular 20 foot truss steel bridge capable of supporting over 2500 lbs. The cost of the new welder was $6990.

Figure 9 – Dynasty 210 Portable Miller TIG welder.

Special Events

Lockheed Martin Contribution

For the second year in a row, Lockheed Martin senior vice president Rod Makoske visited Ware Lab to present checks of $6000 each *to Astrobotics, Baja SAE, BOLT, DBF, Formula SAE* and *HPS*. Corporate sponsorship is a key ingredient in the success of all teams in the Ware Lab as they prepare for upcoming testing and competition events. Many companies, including Lockheed Martin, General Motors, Ford, and SpaceX, support the lab each year and understand the added benefit of hiring Ware Lab students who are well versed in design theory and application.

Figure 10 – Presentation of LM checks to Astrobotics (left) and Baja SAE (right).

Figure 11 – Presentation of LM checks to BOLT (left) and DBF (right).

Figure 12 – Presentation of LM checks to Formula SAE (left) and HPS (right).

STEAM 2019 Event

On November 8th eight Ware Lab teams participated in the 2019 *STEAM (Science, Technology, Engineering, Arts, Math)* event in Roanoke, Virginia. *Astrobotics, Baja SAE, BOLT, Design Build Fly, Formula SAE, Human Powered Sub, Hybrid Electric Vehicle Team,* and *SailBOT* met with over 1500 K-12 students from many schools in the Roanoke service area. Teams displayed at the *Virginia Museum of Transportation*, *Science Museum of Western Virginia* and the *Taubman Museum of Art* where visitors could meet with our students to discuss STEAM and learn more about project organizations. Many students attending the event were from under-represented school districts and were inspired by dedication and skill demonstrated by our Virginia Tech team members. To promote the STEAM event Ware Lab was featured on a Living Local FOX 8…

https://www.wfxrtv.com/lifestyle/living-local/ware-lab-at-virginia-tech/

Ware Lab team members *David Shane* (DBF), *Gillian Hersh* (HPS), and *Paige West* (Steel Bridge) presented, along with Ware Lab manager *Dewey Spangler*.

Ware Lab and the recently opened Advanced Engineering Design Lab plan to participate in the 2020 STEAM event to be held on October 23rd. Since the event will be virtual both labs are in the process of producing video content showcasing all teams. Teams will have live content available to K-12 event participants via Zoom group meetings and other online real-time venues.

Figure 13 – Human Powered Sub (left) and Formula SAE at the Virginia Museum of Transportation for STEAM 2019.

Figure 14 – BOLT at Science Museum of Western Virginia (left) and Baja SAE at Virginia Museum of Transportation during STEAM 2019.

Figure 15 – Ware Lab engine, truss, and carbon fiber display at Taubman Museum of Art for STEAM 2019.

Additional Corporate Sponsorship

In additions to Lockheed Martin, the following companies made sizable contributions to Ware Lab teams:

- **General Motors** $35K total: lab facility ($5K), Formula SAE ($10K), BOLT ($10K), Baja ($10K)
- **Northrop Grumman** Human Powered Submarine ($10K)
- **Leidos** $12K total: $2K each for Formula SAE, Baja SAE, BOLT, Human Powered Sub, Astrobotics, and Design Build Fly.

Without corporate sponsorship teams would not be able to construct and compete project deliverable for regional and international competitions.

Team Competitions

Due to the closing of Ware Lab on March 16 teams did not participate in competition events. Yearly, students participate in regional and national events throughout the United States and it is anticipated, with the reopening of the lab on August 3rd, that teams will be able to pursue competition goals for 2020-21.

Lab Expenditures

Tables 4 and 5 include truck and trailer expenditures, respectively. During 2019-20 the Ware Lab GMC Sierra and Ford F350 trucks traveled over 3100 and 14,300 miles, respectively, to complete various tasks necessary in the construction of project deliverables. Due to all events being canceled, no competition-travel expenditures were encumbered. Truck maintenance expenditures were $8616, trailer expenses were $8692 with $6900 needed to add a new wrap to the gooseneck trailer (Figure 16). All costs associated with the trailer wrap were reimbursed by Virginia Tech's *Student Engineers' Council* (SEC). Appendix C is a comprehensive list of Ware Lab general material, equipment, and maintenance expenditures. Two of the largest expenditures included the purchase of a new TIG Welder ($6985) and the installation of electrical outlets for the BOLT and HPS bays ($3640). All totaled general expenditures were $23,100 for a grand lab total of $33,510 for all material, supplies, maintenance and equipment for this academic year.

Table 4 – GMC and FORD Truck Expenses

Vendor	Vehicle	Total	Item/Purpose
Sheetz (Haymarket, VA)	F350	$129.36	Fuel- Formula trip to Great Falls, VA
Fleet Services	F350	$87.12	Fuel- Formula trip to Great Falls, VA
Auto Experts	F350	$564.76	Oil change, fuel filter, tire rotation
Fleet Services	F350	$743.53	Fuel
Pilot (Shepherdsville, KY)	F350	$124.91	Fuel- Baja trip to Kentucky
Sheetz (Princeton, WV)	F350	$132.95	Fuel- Baja trip to Kentucky
Loftus Gas & Stuff (Georgetown, IN)	F350	$120.72	Fuel- HPS trip to Illinois for mold pickup
Loftus Gas & Stuff (Georgetown, IN)	F350	$112.73	Fuel- HPS trip to Illinois for mold pickup
Fleet Services	F350	$86.42	Fuel- HPS trip to Illinois for mold pickup
Fleet Services	F350	$68.11	Fuel- Formula trip to North Carolina for parts
Englefield (Westerville, OH)	F350	$90.49	Fuel- Formula trip to Michigan for material
Truenorth Shell (Columbus, OH)	F350	$135.13	Fuel- Formula trip to Michigan for material
Fleet Services	F350	$85.73	Fuel- Formula trip to Michigan for material
Auto Experts	F350	$359.84	Oil change, State inspection, Battery
Speedway (Logan, OH)	F350	$82.00	Fuel- Formula trip to Michigan for machining
Marathon Petro (Sandusky, OH)	F350	$127.82	Fuel- Formula trip to Michigan for machining
Fleet Services	F350	$93.30	Fuel- Formula trip to Michigan for machining
Sheetz (Milton, WV)	F350	$39.17	Fuel- HPS trip to Illinois for mold pickup
Loftus Gas & Stuff (Georgetown, IN)	F350	$71.66	Fuel- HPS trip to Illinois for mold pickup
Casey's general store (Vincennes, IN)	F350	$37.23	Fuel- HPS trip to Illinois for mold pickup
Pilot (Nitro, WV)	F350	$110.00	Fuel- HPS trip to Illinois for mold pickup
Fleet Services	F350	$36.31	Fuel- Formula trip to Michigan for mold pick up
Get Go (Groveport, OH)	F350	$93.24	Fuel- Formula trip to Michigan for mold pick up
Duchess RT 95 Store (Marion, OH)	F350	$137.92	Fuel- Formula trip to Michigan for mold pick up
61.4Auto Experts	F350	$564.76	Oil change, fuel filter replaced and rotate tires
Polit (Sunbury, OH)	F350	$122.28	Fuel- Baja trip to Michigan
Flying J (Saginaw, MI	F350	$91.01	Fuel- Baja trip to Michigan
Next Door Store (Mackinaw City, MI)	F350	$76.88	Fuel- Baja trip to Michigan
Festival Foods (Houghton, MI)	F350	$90.22	Fuel- Baja trip to Michigan
Love's (Oak Creek, WI)	F350	$113.51	Fuel- Baja trip to Michigan

Pilot (Indianapolis, IN)	F350	$89.89	Fuel- Baja trip to Michigan
Love's (Bidwell, OH)	F350	$74.36	Fuel- Baja trip to Michigan
BP	F350	$109.01	Fuel- Formula trip to Michigan for material
Fleet Services	F350	$73.44	Fuel- Formula trip to Michigan for material
Duncan Ford	F350	No Charge	Tire leak (warranty), recall work: tailgate and carpet
Duncan Ford	F350	No Charge	Tire leak (warranty)
Precision Glass	GMC	$322.58	Replace rear window in GMC
Auto Experts	GMC	$334.77	Inspection, oil change, air filter, replace window switches
Fleet Services	GMC	$524.59	Fuel
Auto Experts	GMC	$1,531.34	Replace fuel lines and cooler
Auto Experts	GMC	$229.52	Replace glow plug on GMC
Auto Experts	GMC	$156.59	Repair trailer brake relay on GMC
Harvey's Chevrolet	GMC	$108.94	Repair brake box on GMC
Fleet Services	GMC	$86.02	Fuel- Formula trip to DC for materials
Exxon Express (Bridgeport, WV)	GMC	$78.12	Fuel- BOLT trip to PA to pick up new motorcycle
West Virginia Turnpike	N/A	$108.00	Toll
	Total:	**$8,616.49**	

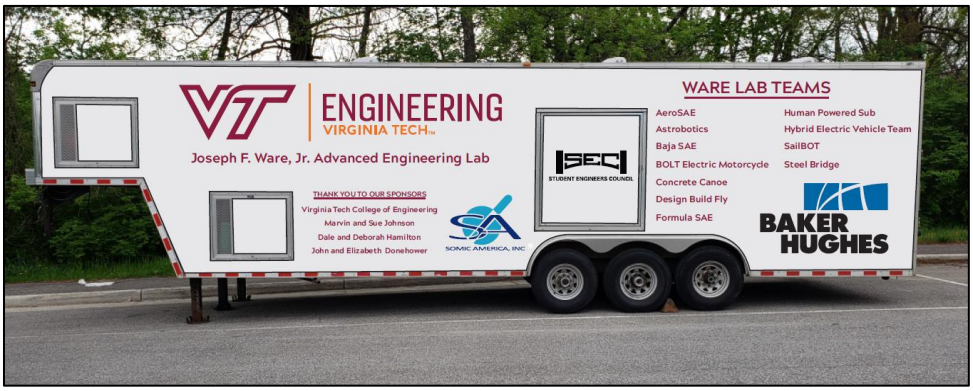

Figure 16 - New gooseneck trailer wrap with lab logo, team list and sponsorship logos.

Table 5 – CEE and Gooseneck Trailer Expenses

Vendor	Trailer	Total	Item/Purpose
Pro-Line Trailer	CEE trailer	$271.00	Yearly Maintenance and Inspection
Pro-Line Trailer	Gooseneck	$1,092.26	Yearly Maintenance and Inspection
Brian's Lock & Key	Gooseneck	$10.00	Replacement keys
Ringgold Pitt Mini Mart (Ringgold, VA)	Gooseneck	$17.39	Formula trip to VIR event
Ringgold Pitt Mini Mart (Ringgold, VA)	Gooseneck	$26.10	Formula trip to VIR event
Fleet Services	Gooseneck	$33.57	Fuel
Signspot	Gooseneck	$6,919.00	Remove and replace graphics*
Auto Experts	Gooseneck	$314.08	Replace two tires
Fleet Services	Gooseneck	$9.10	Fuel
	Total:	**$8,692.50**	

*Gooseneck trailer wrap sponsored by Virginia Tech SEC.

Ware Lab Demographics

Ethnicity, gender, academic major, academic level, transfer information, and volunteer information is gathered each year when students complete the general admissions survey. Summaries of collected data are shown in Tables x through x. Based on collected data, trends in these areas are shown in Tables x and x and Figures x and x. Table x is a list of square footage allocation to each team and common area in Ware Lab. Table x lists ideas on ways Ware Lab can be improved overall. As in previous years, additional team space was indicated as the top concern by students working in the lab.

Table 6 – Ethnicity

Ethnicity	Number	Percent
White/Hispanic	2	0.4
White	369	72.2
Pacific Islander	1	0.2
Multi-ethnic	7	1.4
Middle Eastern	2	0.4
Hispanic	22	4.3
Asian/White	6	1.2
Asian	91	17.8
Arab	1	0.2
African American	10	2.0
Total	**511**	**100.0**

Table 7 – Gender

Gender	Number	Percent
Male	443	87
Female	68	13
Total	**511**	**100**

Table 8 – Academic Major

Major	Number	Percent
AOE	72	14.1
BEAM	5	1.0
BIT	1	0.2
Building Construction	1	0.2
Business	2	0.4
CEE	14	2.7
Communications	1	0.2
CS	21	4.1
ECE	74	14.5
ENGE	78	15.3
ISE	7	1.4
marketing	1	0.2
Mathematics	1	0.2
ME	230	45.0
University Studies	3	0.6
Total	**511**	**100.0**

Table 9 – Team Membership

Ware Lab Team	Number	Percent
Astrobotics	13	2.5
Baja SAE	72	14.1
BOLT	52	10.2
CCT	4	0.8
DBF	72	14.1
Formula SAE	143	28.0
HEVT	52	10.2
HPS	43	8.4
SailBOT	36	7.0
SBT	16	3.1
Undecided	8	1.6
Total	**511**	**100.0**

Table 10 – Academic Level

Level	Number	Percent
Freshman	160	31
Sophomore	136	27
Junior	113	22
Senior	89	17
Grad Student	13	3
Total	**511**	**100**

Table 11 – "How did you learn about Ware Lab?"

Event	Number	Percent
4-H Event	1	0.2
CEED O'Show	56	11.0
Gobblerfest	34	6.7
Online	18	3.5
Team Info Session	226	44.2
Ware Lab Tour	63	12.3
Word-of-Mouth	113	22.1
Total	**511**	**100.0**

Table 12 – Credit vs. Volunteer

Role	Ware Lab Team	Number	Percent Total Lab Population
Volunteer	Astrobotics	13	3
Senior Design	Baja SAE	7	1
Volunteer	Baja SAE	68	13
Independent Study	BOLT	2	0
Senior Design	BOLT	9	2
Volunteer	BOLT	38	7
Volunteer	CCT	4	1
Independent Study	DBF	1	0

Volunteer	DBF	71	14
Independent Study	Formula SAE	7	1
Senior Design	Formula SAE	17	3
Volunteer	Formula SAE	125	25
Independent Study	HEVT	26	5
Senior Design	HEVT	17	3
Volunteer	HEVT	9	2
Volunteer	HPS	44	9
Volunteer	SailBOT	36	7
Volunteer	Steel Bridge	16	3
	Total Credit:	**86**	**17**
	Total Volunteer:	**424**	**83**
	Total:	**510**	**100**

Table 13 – Lab Square Footage

Bay/Area (Room #)	Sq. Ft.	Student Number*	Sq. Ft. per Student
Astrobotics/SailBOT	480	49	10
Baja SAE	550	72	8
BOLT	490	52	9
DBF	250	72	3
FSAE	680	143	5
HPS	1200	43	28
HEVT	980	52	19
SBT	470	16	30
Machine Shop*	1150	NA	NA
Weld Shop*	560	NA	NA
Offices	800	NA	NA
CAD lab*	500	NA	NA
Hallways/Loading Area	2000	NA	NA
Total	**10,110**	**511**	**20**

*Denotes common-use area.

Table 14 – Transfer-Student Population

Transfer College	How did you discover Ware Lab?	Major	Team
Northern Virginia CC	team info session	AOE	DBF
Tidewater CC	team info session	AOE	DBF
University of Miami	team info session	AOE	Formula SAE
Tidewater CC	team info session	Business	Formula SAE
George Mason University	team info session	CS	Formula SAE
Northern Virginia CC	team info session	CS	HEVT
Northern Virginia CC	team info session	CS	HEVT
James Madison University	word-of-mouth	ECE	SailBOT
Lord Fairfax CC	word-of-mouth	ECE	Formula SAE
Tidewater CC	word-of-mouth	ECE	SailBOT
Virginia Commonwealth University	team info session	ENGE	Formula SAE
Germanna CC	Ware Lab tour	ISE	Baja SAE
George Mason University	team info session	ME	Baja SAE
James Madison University	word-of-mouth	ME	Formula SAE

Northern Virginia CC	word-of-mouth	ME	Formula SAE
Rensselaer Polytechnic Institute	team info session	ME	Formula SAE
Reynolds CC	word-of-mouth	ME	Baja SAE
Texas A&M	team info session	ME	HEVT

Table 15 – ISE 2214 Anticipated Enrollment*

Major	Team	Number
ME	Undecided	1
AOE	Astrobotics	1
ECE	Astrobotics	2
ME	Astrobotics	1
CEE	Baja SAE	1
ECE	Baja SAE	1
ENGE	Baja SAE	1
ISE	Baja SAE	1
ME	Baja SAE	20
ECE	BOLT	1
ENGE	BOLT	2
ME	BOLT	6
AOE	DBF	4
ENGE	DBF	1
ECE	Formula SAE	2
ENGE	Formula SAE	9
ME	Formula SAE	31
ME	HEVT	9
ISE	HPS	2
ME	HPS	4
AOE	SailBOT	1
ME	SailBOT	1
ISE	SBT	1
	Total	**103**

*ISE 2214 is required to obtain WL machine shop certification.

Table 16 – "How can Ware Lab be improved?" (from Ware Lab general survey)

With the addition of *Connected and Automated Vehicles* in HEVT it would be beneficial to have a computer lab similar to the CAD lab that has programs such as *OpenCV, MATLAB*, and *Simulink*.
A lab 3d printer.
A location to recycle old power tools.
A new CNC lathe since the Proto Trak cuts parts on a tapper.
A way teams could communicate with one another to share tool/equipment since space and funds are limited.
FSAE is producing two vehicles in the same space normally reserved for one. There are other teams that are not in the lab 3/4 of the year until right before competition - they need to be consolidated to other spaces to redistribute space properly.
Addition of fire extinguisher wall mount, new fire extinguishers.
All-electronic document submission, weekly coordination between teams and management, new CNC lathe, prior notification of tours, more student input on purchases, funding for bay reorganization, Romer arm availability for more hours with better training, trailer interior overhaul with new flooring, wall panels, e-track, wiring, door seals, and generator.
Baja team needs more space.

Better labelled drawers in machine shop.
Better machining equipment.
Better tool organization and layout in the materials prep area.
Better ventilation for HPS bay, easier access to Ware Lab truck and trailer.
More detailed machine shop trainings such as sharping tools, design of fixtures.
More space to work.
Bigger cad lab.
BOLT could use more space and electrical outlets.
Computers need upgrading.
Current metrics used for determining team size and usage (e.g. number of swipes) do not accurately represent usage of the Ware Lab utilities and space. This may lead to mis-identification of resources and space. Suggestion: Look into ways for teams that only use their bays for part of the year to share space if they have different competition cycles (e.g. partner a smaller team with December competition with a small team with a May competition).
Delegation of Ware Lab resources such as vehicles.
Flooding near window of the basement.
Formula needs more space to accommodate the two cars
Fix the basement card access.
Prevent teams from leaving stuff in front of the bay door
Replace the shear and monarch lathe with a Mill-Turn system.
It would be great to have a water jet for cutting material.
Keeping other teams' items out of others bays.
Larger CAD lab.
More organization in the composites bay (work benches with storage), new track in the machine shop, an expedited process to gain access to machine shop/weld shop (currently for a new student the process to gain access is 3 semesters).
More power outlets in the bays.
More space for Formula SAE due EV safety requirements.
Providing information about Ware lab tours/events further ahead of time would allow team leadership to better prepare and have team members available to be in the lab at those times.
Machine shop staying open past 11 pm would be beneficial, many students are on adjusted schedules so we are more alert at 11 pm than 8 am.
Some cad software is out of date. New track for machine shop.
Some teams block the garage door with equipment and materials.
Better space allocation at the garage door for HEVT entering/leaving lab.
Some teams overflow into the hallway, impeding the work of other teams.
Space. It would be nice if our bay was ~1 ft wider.
The basement leaks (well really the whole building leaks actually).
The interior of the Baker Hughes trailer needs to be overhauled and most likely replaced.
A team leader asked me to make an adjustable push bar for the car and I needed a qualified member to help me weld the components together. They were busy and it took a lot of time to finish. Therefore, welding should be taught to every member of the team.
This question would be more valuable if asked towards the middle/end of the spring semester. Most folks have forgotten the most needed improvements by now or are too new to know better.
Increase the size of the BOLT bay.
Larger teams dominate the CAD lab and it becomes difficult for smaller teams to gain access.
Ventilation in the lab overall.
We could use a new CNC mill to replace the TRAK because it will lose its coordinate position randomly.
New TRAK CNC mill in the machine shop. Less than 20 in. per minute feed rate is too slow. Additional electrical outlets in bays.
Better weld shop ventilation, bay windows will not open, Trak encoders fault often and need maintenance.
Astrobotics and SailBOT sharing a bay is not ideal. Also sharing space such as the materials prep bay is not possible since formula uses this space most of the year.

More funding for safety equipment.

Ware Lab Tours

In 2019-20, 83 people visited Ware Lab as shown in Table 17. Typically Ware Lab receives between 1500 to 2000 visitors from K-12 groups, universities, corporations, and Virginia Tech student families. Due to COVID 19 Ware Lab was closed on March 16th to all visitors. It is hoped that in-person tours will resume during the 2021 spring semester.

Table 17 – Ware Lab Tours

Affiliation	Number
Prospective Student	20
VT CEED	20
Virginia Tech Alum	5
Scott Memorial Middle School	20
Virginia Tech Language and Culture Institute	15
Kennametal Inc.	3
Total	**83**

Machine/Weld/Trailer Training

Each year, the assistant lab manager provides comprehensive training for all Ware Lab teams. Training consists of a three-hour session in the machine and weld shop areas. Truck and trailer training is required due to the complexity of hauling a 36 foot goose-neck trailer, used by teams for transportation to competition. Tables 18, 19 and 20 show the number of students trained in these areas.

Table 18 – Machine Shop/Hurco Training

Ware Lab Team	Machine Shop	Advanced Hurco
Astrobotics	1	0
Baja	12	2
BOLT	19	5
Formula	22	6
HEVT	10	0
HPS	3	0
Total	**67**	**13**

Table 19 – Weld Orientation

Ware Lab Team	Number
Baja SAE	4
BOLT	1
FSAE	9
HEVT	3
SBT	4
Total	**21**

Table 20 – Truck/Trailer Training

First	Last	Ware Lab Team	Training	Number

Jason	Chandler	BOLT	BOLT trailer	
Ian	McNair	BOLT	BOLT trailer	
Murray	Re	BOLT	BOLT trailer	
Grayson	Richmond	BOLT	BOLT trailer	
Nicholas	Stamps	BOLT	BOLT trailer	
Alex	Surdam	BOLT	BOLT trailer	**BOLT Total: 6**
Zachary	Hill	Concrete Canoe	CEE trailer	
Jessica	Veihman	Concrete Canoe	CEE trailer	
Andrew	Williams	Concrete Canoe	CEE trailer	**CCT Total: 3**
Jess	Bostic	Formula	Ford/Gooseneck	
Josh	Kintz	Formula	Ford/Gooseneck	
Bryden	Tutko	Formula	Ford/Gooseneck	**FSAE Total: 3**
Matthew	Criss	HPS	CEE trailer	
James	Duval	HPS	CEE trailer	
Gillian	Hersh	HPS	CEE trailer	
Oscar	Johansson	HPS	CEE trailer	
Paul	Keller	HPS	CEE trailer	**HPS Total: 5**
			Total	**17**

Team Lab Access

Students have access to the general areas and machine shop after hours via a card swipe system. Figures 17 and 18 provide a summary of student access to these areas based a team breakdown, providing an indicator of how lab space is utilized. During operating hours, the showroom door is unlocked and students can gain access without using their Hokie passport card. Formula SAE utilized the Ware Lab the most at 48% based on data provided by Virginia Tech Hokie Passport Services.

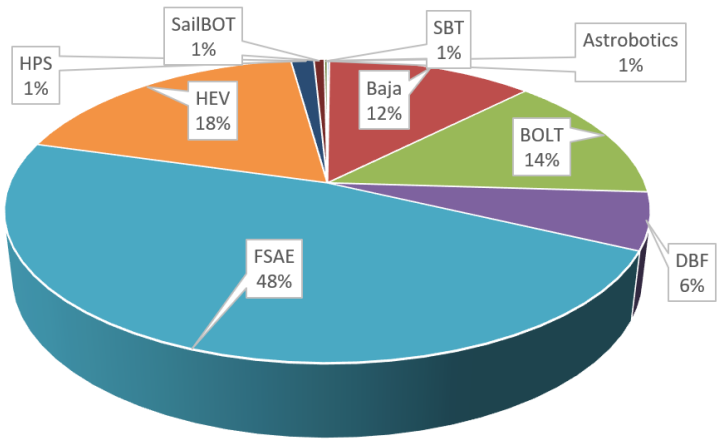

Figure 17 – Team Access to General Ware Lab Area (percentage of total Hokie Card swipes).

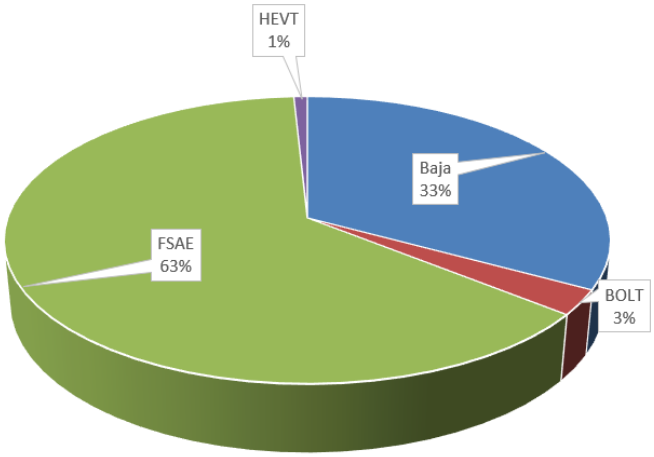

Figure 18 – Team Access to Ware Lab Machine Shop (percentage of total Hokie Card swipes).

Demographic Trends

Since 2012, students using the Ware Lab have completed a survey indicating major, academic level, and team affiliation. Based on collected data, trends in these areas are shown in Figures 19, 20 and 21. Figures 22 and 23 show trends for Ware Lab gender and ethnicity, staring in 2014-15.

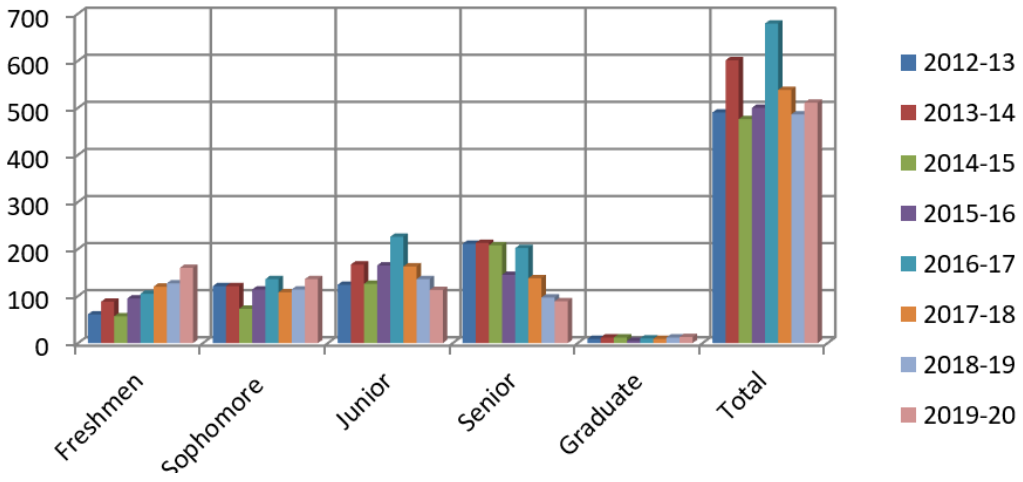

Figure 19 – Academic Levels (number of students).

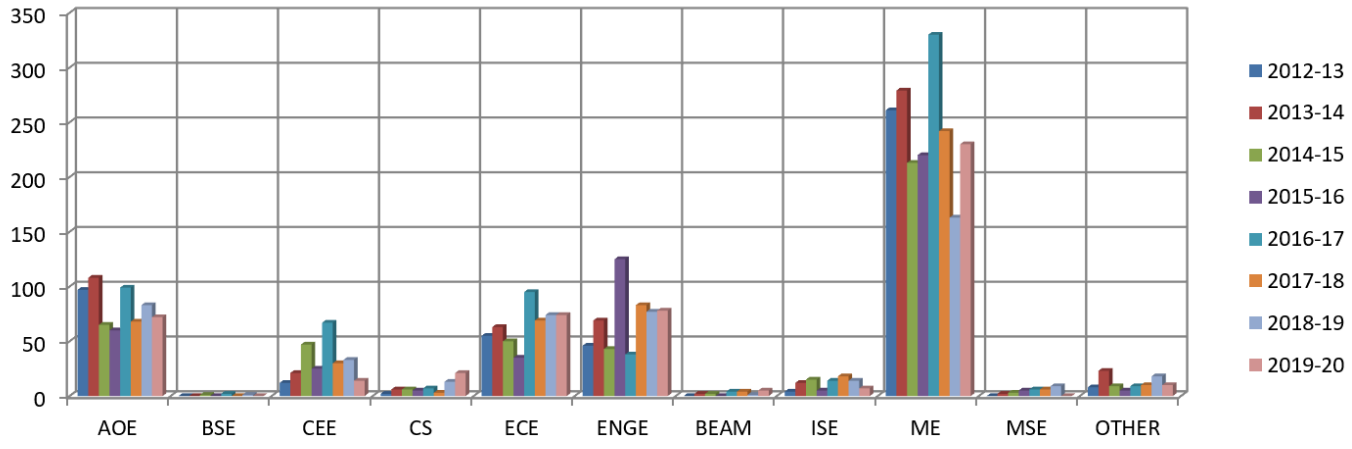

Figure 20 – Academic Majors (number of students).

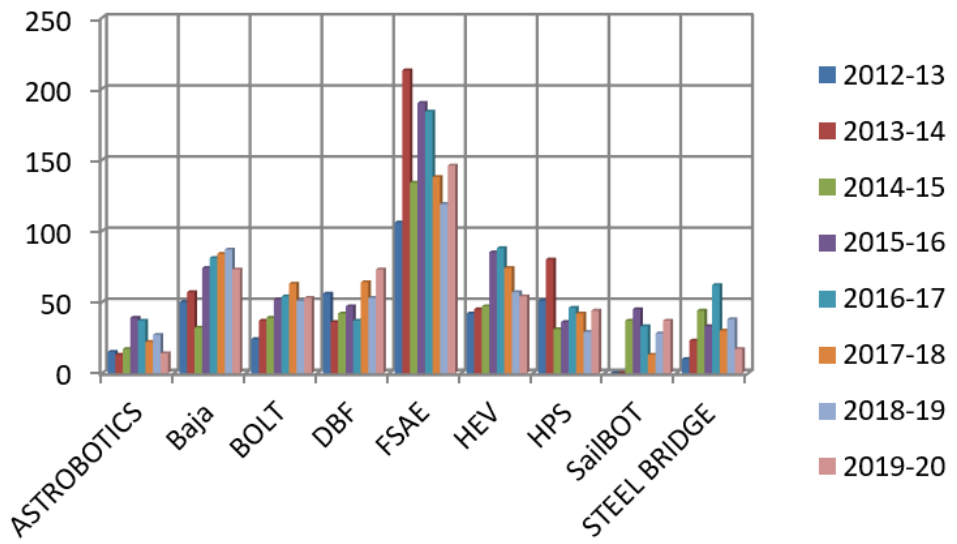

Figure 21 – Teams (number of students).

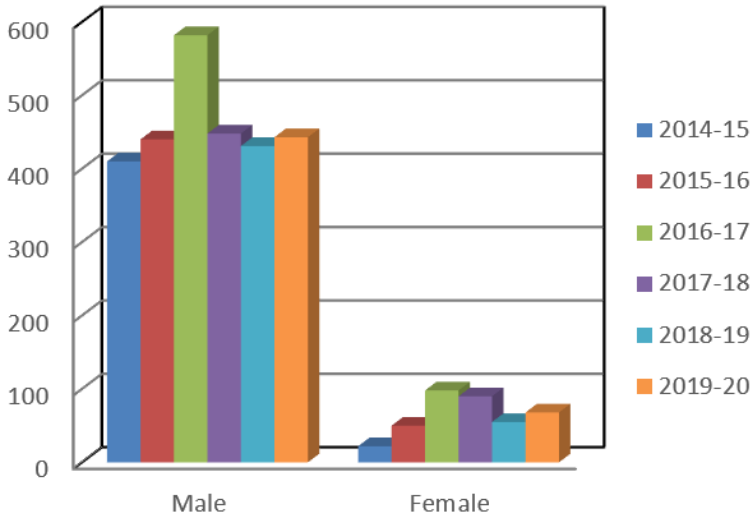

Figure 22 – Gender (number of students).

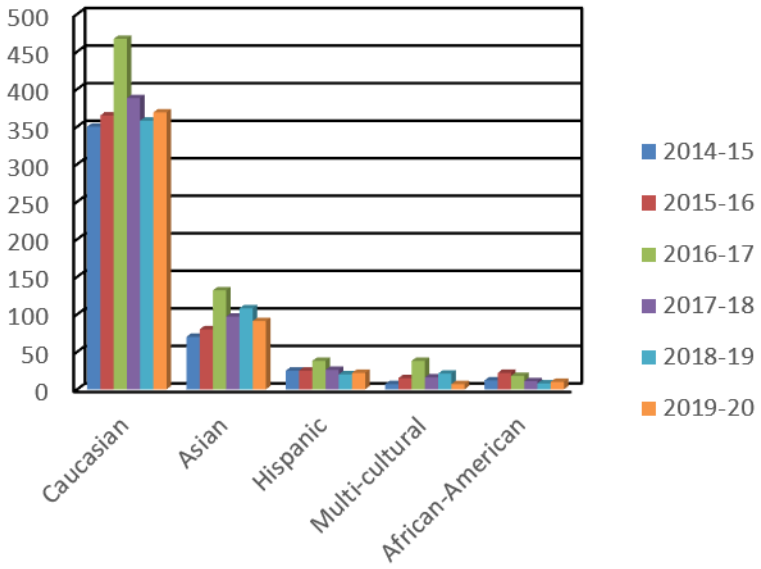

Figure 23 – Ethnicity (number of students).

Conclusion

This summary report for the Joseph F. Ware Advanced Engineering Design Lab includes student demographics, outreach, expenses, and the Ware Lab COVID 19 response. Undergraduates from multiple majors comprise teams that design, manufacture and compete top tier projects. Unfortunately, due to the COVID 19 pandemic all competition projects were canceled for 2019-20.

In addition to participating in regional and international events, Ware Lab teams take part in multiple outreach venues giving corporations, K-12 groups, universities, and the general public a chance to experience the outstanding work performed by our students. The Joseph F. Ware, Jr. Advanced Engineering Lab continues to be the main focal point of undergraduate team competitions for Virginia Tech's College of Engineering.

Appendix A – Ware Lab Planning Tool Room Capacities

Figures A1 through A13 correspond to Figures 1 through 13 in the Ware Lab Planning Tool. For a complete copy of this document contact Ware Lab/AEDL management at spangler@vt.edu.

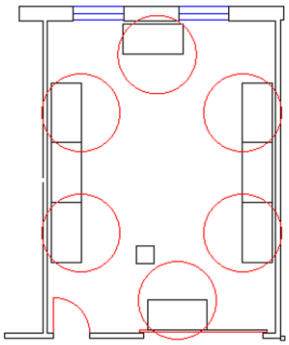

Figure A1 – CAD Lab (6 max).

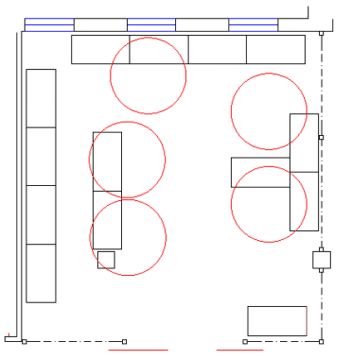

Figure A2 – Formula SAE Bay (5 max).

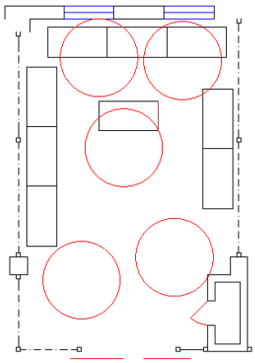

Figure A3 – BOLT Bay (5 max).

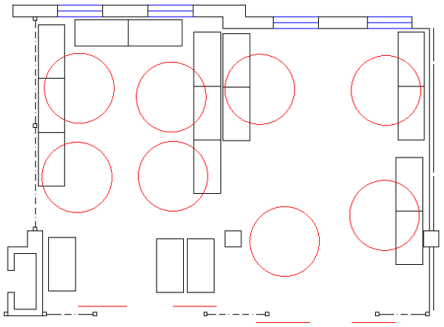

Figure A4 – HEVT Bay (8 max).

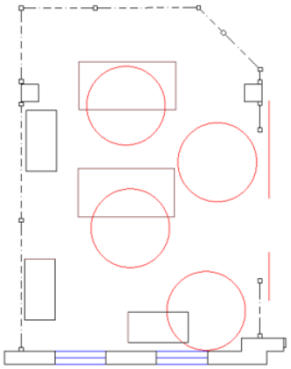

Figure A5 – Material Prep Bay (4 max).

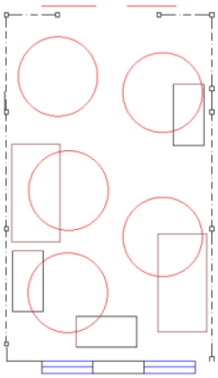

Figure A6 – Steel Bridge Bay (5 max).

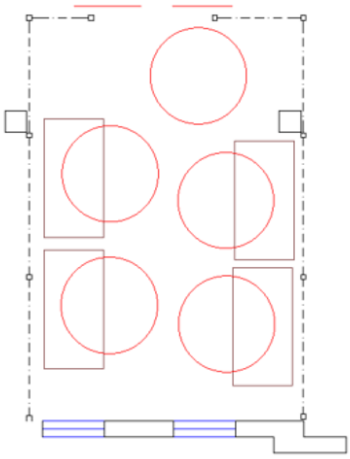

Figure A7 – Astrobotics/SailBOT Bay (5 max)**.**

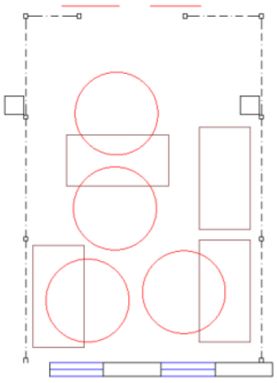

Figure A8 – DBF Bay (4 max).

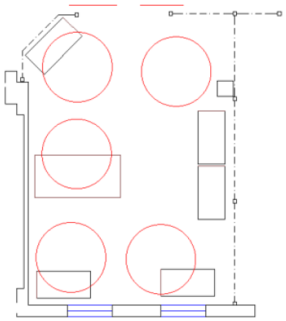

Figure A9 – Baja SAE Bay (5 max).

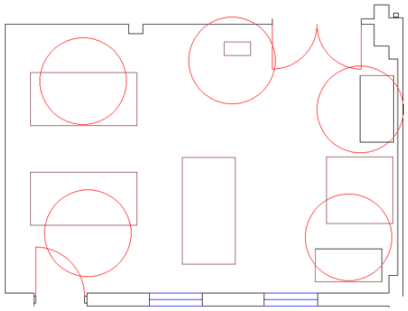

Figure A10 – Weld Shop (5 max).

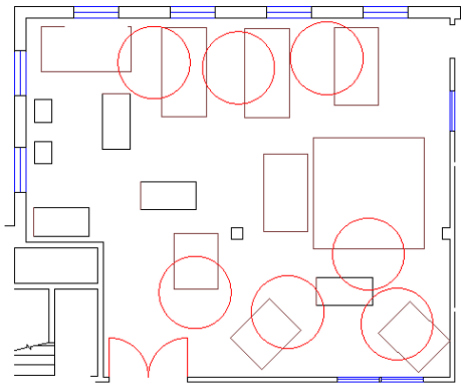

Figure A11 – Machine Shop (7 max).

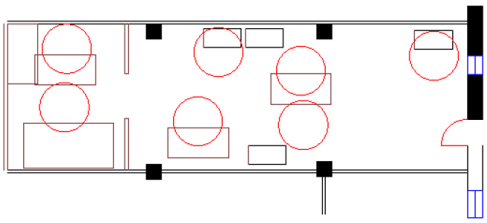

Figure A12 – Human Powered Sub Bay (7 max).

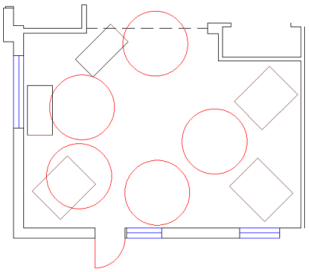

Figure A13 – Ware Lab Showroom (5 max).

Appendix B – COVID 19 Ware Lab SOP

SOP First Page: *To be displayed on project bay wall (for a copy of the complete SOP contact Ware Lab management at spangler@vt.edu):*

COVID-19 Standard Operating Procedures for On-Site Laboratories – Ware Lab
This first page must be displayed on the project bay cage visible from the hallway.
Updated: 07.23.2020

Ware Lab Team Name:	
Ware Lab Team Faculty Advisor(s):	
Date admission to lab approved by team faculty advisor:	
Internal Lab Safety Coordinators/Lab Managers:	Dewey Spangler, Phillip Ratcliff
Lab Phone: 540-553-5863	
Location:	320 Stanger Street, Blacksburg VA, 24061
Project Bay Room Number:	

SOP Last Page: *To be completed by each team and submitted to Ware Lab management:*

Training Documentation of (signature of all users is required)
Principal Investigator Standard Operating Procedures Approval

Team Faculty Advisor

Print name:_____

Signature: _____

Co-Team Faculty Advisor (If applicable)

Print name: _____

Signature: _____

Approval Date: _____

Team Lead (or safety officer): _____

I have read and understand

Print Student Name	Signature	Date

Other Team Personnel working in AEDL: I have read and understand

Print Student Name	Signature	Date

Appendix C – General Lab Expenditures

Table C1 – Ware Lab General Expenditures for 2019-20

Vendor	Item	COST
Homestead Materials Handling	Forklift repair	$848.53
The Supply Room Companies Inc	Tidal Paper 500 Sheets/Ream	$38.23
Guy Brown Products	Dell 2K1VC Yellow Toner Cartridge	$154.99
Guy Brown Products	Dell V4TG6 Magenta Toner Cartridge	$154.99
Guy Brown Products	Dell 67H2T Black Toner Cartridge	$135.99
Guy Brown Products	Dell TW3NN Cyan Toner Cartridge	$154.99
MSC	Laminated Steel Padlock for Gooseneck trailer	$31.40
MSC	Simple Green 1 Gal Glass Cleaner	$38.02
MSC	Simple Green 1 Gal All Purpose Cleaner	$18.68
MSC	Cyclone 50 Cartridge Filter	$27.37
MSC	Cyclone 50 Filter Bag	$38.97
Homestead Materials Handling	Forklift repair	$268.80
Arc3 gases	ARGON - 300	$91.36
Arc3 gases	CARBON DIOXIDE - 20# SIPHON TUBE	$24.72
Arc3 gases	PLASMA GREEN (5 GAL PAIL) KCI RUST INHIBTOR	$200.00
Arc3 gases	HAZMAT/COMPLIANCE	$4.95
Arc3 gases	Delivery Charge	$24.95
MSC	Size M Nitrile Disposable Gloves	$49.74
MSC	Size L Nitrile Disposable Gloves	$49.74
MSC	Size XL Nitrile Disposable Gloves	$49.74
MSC	Shank Diam Crimped Steel Wheel Brush	$12.88
MSC	Standard Length Nylon Tube	$0.74
MSC	WypAll X60 Dry Shop Towel/Industrial Wipes	$179.98
MSC	8 oz Bottle Cutting & Tapping Fluid	$87.84
MSC	AlumTap 16 oz Bottle Cutting & Tapping Fluid	$154.08
MSC	4 oz Extreme Pressure Grease	$8.90
McMaster-Carr	Anti-Vibration Long-Life Band Saw Blade	$241.40
Guy Brown	HP 410A Black Toner Cartridge	$80.04
Guy Brown	HP 410A Magenta Toner Cartridge	$104.73
Guy Brown	HP 410A Yellow Toner Cartridge	$104.73
Guy Brown	HP 410A Cyan Toner Cartridge	$104.73
Arc3 gases	Industrial lease - 1 year	$61.00
Blacksburg Auto Parts	Copper Auto NGK: BPR4EY spark plugs	$5.16
Amazon.com	Powermate Vx 034-0197RP Pressure Switch	$23.75
Amazon.com	DuraChoice Dial Utility Pressure Gauge	$7.71
Amazon.com	Control Devices ST Series Brass ASME Safety Valve	$5.31
Amazon.com	LASCO Pipe Sealant Tape	$5.08
Amazon.com	Sea Foam 16 Ounce, Pack of 2, 16. Fluid_Ounces	$19.15
Amazon.com	Cummins SAE 15W-40 Oil - 1 Quart (Quantity 4)	$40.00
Amazon.com	Cummins Onan Fuel Filter	$12.48
Amazon.com	Cummins Onan Oil Filter	$11.42
Amazon.com	Cummins Onan Air Filter	$15.46
Guy Brown	Dell Waste Toner Collector	$19.99
Homestead Materials Handling	Forklift maintenance	$87.00
MSC	Series 6000 Size M Half Mask Respirator	$74.80
MSC	Yellow and Magenta P100 Cartridge and Filter Combination	$181.02
MSC	Polypropylene Counter Duster hand brush	$28.98
MSC	5 Piece Plain Edge High Speed Steel Combo Drill, Countersink Set	$27.98
MSC	Double Single End Center and Edge Finder Set Mechanical	$41.82

MSC	Wet/Dry Vacs Power Type: Electric Type: Wet/Dry Vacuum	$83.16
MSC	Series 6000 Size L Half Mask Respirator	$37.40
MSC	Yellow and Magenta P100 Cartridge and Filter Combination	$60.34
Hose House	1/8" Stainless Steel Hose W/Teflon	$11.34
Hose House	Braided Hose Insert - Silver	$8.40
Hose House	1/4" Female JIC	$16.50
Hose House	1/4" tube 1/8" pipe male connector	$1.45
Hose House	1/4" tube 1/4" pipe male connector	$1.89
Hose House	1/4" tube 1/8" pipe female connector	$1.81
Hose House	1/4" tube 1/8" pipe	$5.25
Arc3 gases	Nozzle HYPERTHERM	$30.80
Arc3 gases	CAP HYPERTHERM	$38.00
Arc3 gases	SHIELD HYPERTHERM	$30.88
Arc3 gases	ELECTRODE HYPERTHERM	$81.00
Arc3 gases	DYNASTY 210 W/WL FOOT CONTROL MILLER TIG WELDER	$6,985.00
Arc3 gases	REMOTE AMP INSTALLED (MILLER) CK WORLDWIDE	$213.15
Arc3 gases	DENZ CONNECER	$10.00
Arc3 gases	200AMP,2 HOSE, AIR COOLED CK WORLDWIDE	$110.00
Arc3 gases	10' TIG TORCH COVER POWERWELD	$19.00
Arc3 gases	Delivery Charge	$24.95
Sarver's Hydraulics, INC.	Service call to inspect lift (HEVT bay)	$220.00
MSC	1 Gal Container Mineral Way Oil	$103.96
MSC	TRIM MicroSol 585XT 5 Gal Pail Cutting & Grinding Fluid	$155.00
MSC	1 Gal Bottle AllPurpose Cleaner	$18.68
MSC	Peak Blue DEF Diesel Exhaust Fluid	$55.88
The Supply Room Companies Inc	Tidal Print Paper 500 Sheets/ Ream	$40.52
Arc3 gases	Cylinder Lease - 1 year	$61.00
Arc3 gases	1 PHASE 250 VOLT 50 AMP PLUG	$13.84
Arc3 gases	ARGON - 300	$45.68
Arc3 gases	HAZMAT/COMPLIANCE	$4.95
Arc3 gases	NITROGEN - 200	$15.30
Arc3 gases	Delivery Charger	$24.95
Alro Steel	Aluminum Tubing 1 OD X .125 WALL (.750 ID), length 12 FT	$97.68
Alro Steel	Fuel Surcharge	$9.95
Arc3 gases	225 AMP WATERCOOLED WP-20 WELDMARK TIG TORCHBODY	$89.20
Arc3 gases	Delivery Charge	$24.95
Arc3 gases	Industrial lease - 1 year	$122.00
Amazon.com	Fengbao 2PCS Kitchen Sink Strainer	$13.98
MSC	CAT40 1/32 to 1/2" Capacity Steel Integral Shank Drill Chuck	$539.98
MSC	Tapfree Excel 8 oz Bottle Cutting & Tapping Fluid	$87.84
MSC	AlumTap 16 oz Bottle Cutting & Tapping Fluid	$154.08
MSC	Peak Blue Diesel Exhaust Fluid	$55.88
Sanico	PFNITRILE-LARGE Powder Free Large Nitrile Gloves 100/bx	$36.00
Sanico	PFNITRILE-MEDIUM Powder Free Nitrile Glove Medium 100/box	$36.00
Amazon.com	Meguiar's G55153 Leather Care Kit	$21.70
Amazon.com	Meguiar's X2020 Supreme Shine Microfiber Towels, Pack of 3	$6.20
Amazon.com	MEGUIAR'S G191016 16 Ounce 3-in-1 Wax Kit	$15.19
Amazon.com	Meguiar's G16216 Ultimate Interior Detailer, 15.2 oz	$8.84
Dominion Air	25729 FOLD-AWAY HANDLE (OLD 30922)	$284.00
Dominion Air	SERVICE/REPAIR TRAK	$220.00
Dominion Air	TRAVEL, LABOR - MACHINE SERVICE - HYLTON	$110.00
Dominion Air	MILEAGE INCURRED FOR TRAK SERVICE	$37.50
Dominion Air	16425-1R COMPUTER MODULE LX2	$971.00
Dominion Air	Freight	$38.90

MSC	M4x0.7 Stem Revolving Folding Handwheel & Machine Handle	$45.58
MSC	3/816 Threaded Stem Revolving Handwheel & Machine Handle	$18.95
MSC	2 Clear Lenses AntiFog Framed Magnifying Safety Glasses	$35.46
Grainger	TK37701887T Lockout Padlock Key Type Different (red)	$25.56
Grainger	TK37701888T Lockout Padlock Key Type Different (orange)	$26.10
Grainger	TK37701889T Lockout Padlock Key Type Different (yellow)	$52.20
MSC	0.2362 Inch Ball Diameter Ceramic Stem M4 Thread Ruby Point Ball Tip CMM Stylus	$269.24
MSC	Series 6000 Size S Half Mask Respirator	$93.50
VT Facilities Services	Electrical work in Formula, BOLT and HPS Bays	$3,640.00
Sanico	PFNITRILE-LARGE Powder Free Large Nitrile Gloves 100/bx	$120.00
Legion Safety	Cementex BL-C Low Voltage Insulating Blankets	$176.92
Legion Safety	Knipex Insulating Snipe Nose Plastic Pliers	$28.40
Magidglove	Electrical Glove Testing	$10.60
Magidglove	Size 9 Ansell 11" Class 00 Black Rubber Insulating Gloves	$88.30
Amazon.com	Fluke TL175E TwistGuard Double Insulated Silicone Test Lead Set	$31.49
Arc3 gases	Industrial Lease - 1 year	$124.00
Batteries Plus LLC	3.6V 1/2AA Thionyl Chloride Battery 1/2AA Lithium (for Hurco)	$119.88
Batteries Plus LLC	Duracell ProCell Industrial AAA Alkaline Batteries	$9.12
MSC	6 Piece Cantilever Clamp Set	$135.00
MSC	X50 Dry Shop Towel/Industrial Wipes	$147.80
MSC	40 Qt Bag Clay Granular Absorbent	$40.83
Arc3 gases	ARGON - 300	$137.04
Arc3 gases	HAZMAT/COMPLIANCE	$4.95
Arc3 gases	Delivery Charge	$24.95
Amazon.com	Fluke TL175E TwistGuard Double Insulated Silicone Test Lead Set	$31.49
MSC	TRIM MicroSol 585XT 5 Gal Pail Cutting & Grinding Fluid	$310.00
Guy Brown	Dell 2K1VC Yellow Toner Cartridge	$151.99
Guy Brown	Dell 67H2T Black Toner Cartridge	$140.99
Guy Brown	Dell TW3NN Cyan Toner Cartridge	$166.99
Guy Brown	Dell V4TG6 Magenta Toner Cartridge	$158.99
Dominion Air	LABOR - MACHINE SERVICE-KOVACEVIC	$110.00
Dominion Air	TRAVEL-LABOR - MACHINE SERVICE-KOVACEVIC	$165.00
Dominion Air	MILEAGE INCURRED FOR SERVICE	$60.00
Titletown Oil CORP.	Repair of car wash sign in Green Bay, WI	$706.84
Surplus Property	Office chairs	$30.00
	Total:	**$23,103.43**

Appendix D – Comprehensive List of Ware Lab Students for 2019-20

Table D1 – Ware Lab Student Team Membership for 2019-20

First	Last	Major	Level	Credit?	Ware Lab Team
Grant	Anderson	ME	Sophomore	Volunteer	Astrobotics
Michael	Coyle	ENGE	Freshman	Volunteer	Astrobotics
Joseph	Dyer	CS	Junior	Volunteer	Astrobotics
Robert	Forsyth	ECE	Freshman	Volunteer	Astrobotics
Maaz	Hasan	ENGE	Freshman	Volunteer	Astrobotics
Aidan	Hemstreet	ME	Freshman	Volunteer	Astrobotics
Noah	Hull	ME	Sophomore	Volunteer	Astrobotics
Karthik	Kashyap	ECE	Sophomore	Volunteer	Astrobotics
Henry	Kwon	ENGE	Freshman	Volunteer	Astrobotics
Chau	Le	ECE	Freshman	Volunteer	Astrobotics
Pedro	Schneider	AOE	Sophomore	Volunteer	Astrobotics
Maxwell	Stelmack	ECE	Sophomore	Volunteer	Astrobotics
Thomas	White	ME	Senior	Volunteer	Astrobotics
David	Aden	ME	Senior	Senior Design	Baja SAE
Kaitlyn	Baldwin	BEAM	Junior	Volunteer	Baja SAE
Alexander	Baptista	ME	Sophomore	Volunteer	Baja SAE
Tyler	Best	ENGE	Freshman	Volunteer	Baja SAE
Devereux	Betzer	ME	Freshman	Volunteer	Baja SAE
Michael	Bock	CS	Sophomore	Volunteer	Baja SAE
Thomas	Bolton	ME	Freshman	Volunteer	Baja SAE
Cory	Carlton	ME	Junior	Volunteer	Baja SAE
Pusan	Chakraborty	ME	Junior	Volunteer	Baja SAE
Daniel	Chirvasuta	ME	Junior	Volunteer	Baja SAE
Ilan	Chueca	ME	Sophomore	Volunteer	Baja SAE
Henry	Claesson	ME	Sophomore	Volunteer	Baja SAE
Hunter	Clark	ME	Senior	Volunteer	Baja SAE
Julian	Cohen	ME	Sophomore	Volunteer	Baja SAE
Alex	Coonin	ME	Sophomore	Volunteer	Baja SAE
Dhietmar	Cruz Herbas	ME	Sophomore	Volunteer	Baja SAE
James	Dale	ME	Junior	Volunteer	Baja SAE
Colin	David	ME	Sophomore	Volunteer	Baja SAE
Melanie	Do	Communications	Senior	Volunteer	Baja SAE
Henry	Elich	ME	Senior	Senior Design	Baja SAE
Ziming	Fang	ME	Junior	Volunteer	Baja SAE
John	Gilleran	ME	Senior	Senior Design	Baja SAE
Joey	Griffiths	ME	Grad Student	Volunteer	Baja SAE
Genevieve	Gural	ME	Grad Student	Volunteer	Baja SAE
Benjamin	Hellmann	ISE	Junior	Volunteer	Baja SAE
Anna	Herms	CS	Sophomore	Volunteer	Baja SAE
David	Hornberger	ME	Junior	Volunteer	Baja SAE
Benjamin	Hubinger	ME	Junior	Volunteer	Baja SAE
Brennan	Hurst	CS	Sophomore	Volunteer	Baja SAE
Jenifer	Hymanson	ME	Junior	Volunteer	Baja SAE
Steve	Jones	CS	Sophomore	Volunteer	Baja SAE
Josh	Jones	ME	Senior	Senior Design	Baja SAE

Jim	Kaindu	ME	Junior	Volunteer	Baja SAE
James	Kasch	ME	Sophomore	Volunteer	Baja SAE
Alex	Kelleher	ENGE	Freshman	Volunteer	Baja SAE
Kendall	Knight	ME	Junior	Volunteer	Baja SAE
Tadeusz	Kosmal	ME	Junior	Volunteer	Baja SAE
Keith	Le	CS	Freshman	Volunteer	Baja SAE
Matthew	Looney	ME	Senior	Volunteer	Baja SAE
Siddhant	Mahajan	ME	Junior	Volunteer	Baja SAE
Christopher	Mason	ME	Sophomore	Volunteer	Baja SAE
Destiny	Mason	ME	Sophomore	Volunteer	Baja SAE
Joseph	Mensch	ME	Sophomore	Volunteer	Baja SAE
Leo	Miele	ENGE	Freshman	Volunteer	Baja SAE
Matthew	Moneghan	ME	Grad Student	Volunteer	Baja SAE
Owen	Murphy	ME	Sophomore	Volunteer	Baja SAE
Keith	Myburgh	CS	Sophomore	Volunteer	Baja SAE
Morgan	Newcomb	CEE	Junior	Volunteer	Baja SAE
Enrique	Oceguera	ME	Senior	Senior Design	Baja SAE
Enrique	Oceguera	ME	Senior	Senior Design	Baja SAE
Marisa	Ostrowsky	AOE	Sophomore	Volunteer	Baja SAE
Annabelle	Palmer	ME	Sophomore	Volunteer	Baja SAE
Mark	Pandol	ME	Freshman	Volunteer	Baja SAE
Sam	Pasti	ME	Sophomore	Volunteer	Baja SAE
Sanam	Patel	ME	Junior	Volunteer	Baja SAE
Julia	Pimentel	ME	Sophomore	Volunteer	Baja SAE
Joshua	Putney	ME	Sophomore	Volunteer	Baja SAE
Allison	Roush	ME	Sophomore	Volunteer	Baja SAE
Benjamin	Saks	ME	Junior	Volunteer	Baja SAE
Matthew	Shealy	ME	Sophomore	Volunteer	Baja SAE
Aryan	Sinhal	ME	Sophomore	Volunteer	Baja SAE
Jeff	Stout	ME	Senior	Senior Design	Baja SAE
Daniel	Stover	ECE	Freshman	Volunteer	Baja SAE
Taylor	Tegtmeyer	ME	Freshman	Volunteer	Baja SAE
Christopher	Tong	ME	Junior	Volunteer	Baja SAE
John	Veliky	ME	Junior	Volunteer	Baja SAE
Joseph	Wall	ME	Senior	Volunteer	Baja SAE
Bradley	Wharton	ENGE	Freshman	Volunteer	Baja SAE
Derick	Whited	AOE	Grad Student	Volunteer	Baja SAE
Ryan	Yang	ME	Junior	Volunteer	Baja SAE
Brad	Zienty	ENGE	Freshman	Volunteer	Baja SAE
Larkin	Andreaus	ME	Junior	Volunteer	BOLT
Brittney	Antous	ME	Junior	Volunteer	BOLT
Kyle	Berger	ECE	Senior	Volunteer	BOLT
Filip	Boshkovski	ME	Senior	Independent Study	BOLT
Derek	Bruce	CS	Sophomore	Volunteer	BOLT
William	Campbell	ECE	Senior	Senior Design	BOLT
Erin	Cox	ECE	Freshman	Volunteer	BOLT
Alexander	Downey	ECE	Freshman	Volunteer	BOLT
Caleb	Esatto	CS	Freshman	Volunteer	BOLT
Sture	Forsman	ENGE	Freshman	Volunteer	BOLT

Alec	Framm	ME	Junior	Independent Study	BOLT
Erin	Freck	ENGE	Freshman	Volunteer	BOLT
Will	Gessner	ME	Sophomore	Volunteer	BOLT
Collin	Gray	ECE	Sophomore	Volunteer	BOLT
Patrick	Graybeal	ECE	Sophomore	Volunteer	BOLT
Nathan	Guy	ECE	Sophomore	Volunteer	BOLT
Kristen	Harrell	ECE	Sophomore	Volunteer	BOLT
Brandon	Harris	ME	Sophomore	Volunteer	BOLT
Maaz	Hasan	ENGE	Freshman	Volunteer	BOLT
Heather	Hawley	ME	Senior	Senior Design	BOLT
William	Hom	ME	Junior	Volunteer	BOLT
Alexander	Hutchins	ME	Junior	Volunteer	BOLT
Addison	Jacunski	ECE	Junior	Volunteer	BOLT
Parker	Jones	ME	Sophomore	Volunteer	BOLT
Evan	Jost	ME	Sophomore	Volunteer	BOLT
Madison	Kidd	ME	Freshman	Volunteer	BOLT
Ioannis	Kousidis	ME	Sophomore	Volunteer	BOLT
Trevor	Lew	ECE	Freshman	Volunteer	BOLT
Talise	Lindorf	ENGE	Freshman	Volunteer	BOLT
Maxwell	Mcallister	ME	Sophomore	Volunteer	BOLT
Robert	McCulloch	ECE	Sophomore	Volunteer	BOLT
Ian	McNair	ME	Senior	Senior Design	BOLT
Quinton	Miller	ECE	Senior	Senior Design	BOLT
Nathan	Moeliono	ECE	Sophomore	Volunteer	BOLT
Elizabeth	Parent	ME	Junior	Volunteer	BOLT
Christopher	Purdy	ECE	Senior	Volunteer	BOLT
Ashton	Re	ME	Junior	Volunteer	BOLT
Dalton	Reck	ENGE	Freshman	Volunteer	BOLT
Grayson	Richmond	ME	Senior	Senior Design	BOLT
Sam	Schoedel	ECE	Sophomore	Volunteer	BOLT
Tyler	Shaffer	ECE	Senior	Senior Design	BOLT
Jacob	Smethurst	CS	Senior	Volunteer	BOLT
Nicholas	Stamps	ECE	Senior	Senior Design	BOLT
Hunter	Stapp	ECE	Senior	Volunteer	BOLT
Corri	Stevenson	ME	Senior	Senior Design	BOLT
Alexander	Surdam	ME	Junior	Volunteer	BOLT
Anton	Tyapkin	ENGE	Freshman	Volunteer	BOLT
Adam	Tyler	ME	Sophomore	Volunteer	BOLT
Nolan	Vess	ME	Sophomore	Volunteer	BOLT
Kyle	Walsh	ENGE	Freshman	Volunteer	BOLT
Stephen	Welch	ECE	Freshman	Volunteer	BOLT
Christopher	Yehle	ME	Senior	Senior Design	BOLT
Megan	Beever	CEE	Junior	Volunteer	CCT
Zachary	Hill	CEE	Junior	Volunteer	CCT
Jessica	Viehman	CEE	Junior	Volunteer	CCT
Andrew	Williams	CEE	Junior	Volunteer	CCT
Audrey	Abadilla	ME	Freshman	Volunteer	DBF
Jack	Barnes	AOE	Sophomore	Volunteer	DBF
John	Bennett	ENGE	Freshman	Volunteer	DBF

Ryan	Bowman	AOE	Sophomore	Volunteer	DBF
Adam	Bush	AOE	Sophomore	Volunteer	DBF
Amanda	Butynes	AOE	Senior	Independent Study	DBF
David	Campos Ramirez	AOE	Junior	Volunteer	DBF
Jared	Cesen	CS	Freshman	Volunteer	DBF
Shreya	Chandramouli	AOE	Senior	Volunteer	DBF
Matthew	Chitre	ENGE	Freshman	Volunteer	DBF
Zachary	Collins	AOE	Freshman	Volunteer	DBF
Jaison	Dasika	ME	Freshman	Volunteer	DBF
Zachary	Dawson	AOE	Freshman	Volunteer	DBF
Michael	Deitch	AOE	Sophomore	Volunteer	DBF
Samantha	Derasse	ENGE	Freshman	Volunteer	DBF
Ethan	Dingus	ENGE	Freshman	Volunteer	DBF
Devan	Eilbert	AOE	Freshman	Volunteer	DBF
Sam	Elder	ENGE	Freshman	Volunteer	DBF
Thomas	Evans	ME	Sophomore	Volunteer	DBF
John	Fiorini	AOE	Freshman	Volunteer	DBF
Colin	Fischer	AOE	Sophomore	Volunteer	DBF
Ryan	Fisher	AOE	Senior	Volunteer	DBF
Jack	Fox	AOE	Freshman	Volunteer	DBF
Max	Gannon	ENGE	Freshman	Volunteer	DBF
Katelyn	Geibel	ENGE	Freshman	Volunteer	DBF
Ross	Goldberg	ENGE	Freshman	Volunteer	DBF
Darian	Green	ENGE	Freshman	Volunteer	DBF
Michael	Hancock	ENGE	Freshman	Volunteer	DBF
Victoria	Hardy	ME	Freshman	Volunteer	DBF
Parker	Harrsen	ME	Sophomore	Volunteer	DBF
Michael	Heng	AOE	Senior	Volunteer	DBF
Michael	Hiney	AOE	Freshman	Volunteer	DBF
Lemuel	Hook	AOE	Sophomore	Volunteer	DBF
Drew	Hopkins	ENGE	Freshman	Volunteer	DBF
Nathan	Horner	AOE	Sophomore	Volunteer	DBF
Napakorn	Junloy	AOE	Freshman	Volunteer	DBF
David	Kennedy	AOE	Sophomore	Volunteer	DBF
Andrew	Kim	ENGE	Freshman	Volunteer	DBF
Madeline	Kogelis	ENGE	Freshman	Volunteer	DBF
Alby	Koolipurackal	ENGE	Freshman	Volunteer	DBF
Muthu	Kumar	AOE	Freshman	Volunteer	DBF
Scott	Larsen	AOE	Freshman	Volunteer	DBF
Jason	Lee	BEAM	Senior	Volunteer	DBF
Timothy	Lee	ECE	Senior	Volunteer	DBF
Kevin	Lizarazu-Ampuero	AOE	Freshman	Volunteer	DBF
Paras	Mainkar	ENGE	Freshman	Volunteer	DBF
Kristian	Meland	AOE	Freshman	Volunteer	DBF
Robert	Mendoza	AOE	Senior	Volunteer	DBF
Austin	Merrill	AOE	Sophomore	Volunteer	DBF
Hojin	Mun	ENGE	Sophomore	Volunteer	DBF
Jason	Nichols	AOE	Junior	Volunteer	DBF
Jeffrey	Nolte	ME	Senior	Volunteer	DBF

Pranay	Patel	AOE	Freshman	Volunteer	DBF
Jaimin	Patel	ENGE	Freshman	Volunteer	DBF
Rishi	Patel	ENGE	Freshman	Volunteer	DBF
Ryan	Ragasa	ENGE	Freshman	Volunteer	DBF
Taylor	Ransford	AOE	Sophomore	Volunteer	DBF
Evan	Raschid	AOE	Junior	Volunteer	DBF
Madhurya	Ratnakar	ECE	Junior	Volunteer	DBF
Darius	Rieger	ENGE	Freshman	Volunteer	DBF
Connor	Sanchez	ENGE	Freshman	Volunteer	DBF
Erin	Schiefelbein	ENGE	Freshman	Volunteer	DBF
Michael	Sciacca	AOE	Freshman	Volunteer	DBF
Avery	Sebolt	AOE	Senior	Volunteer	DBF
David	Shane	AOE	Senior	Volunteer	DBF
Robert	St. Onge	ENGE	Freshman	Volunteer	DBF
Brady	Thoresen	AOE	Sophomore	Volunteer	DBF
Bryan	Tsang	AOE	Senior	Volunteer	DBF
Aaron	Vickers	AOE	Freshman	Volunteer	DBF
Ella	Waide	ENGE	Freshman	Volunteer	DBF
Kensey	Wishon	ME	Freshman	Volunteer	DBF
Sean	Zylich	ENGE	Freshman	Volunteer	DBF
Ayaz	Adatia	ECE	Junior	Volunteer	Formula SAE
Shaurya	Ahuja	ME	Senior	Senior Design	Formula SAE
Siddharth	Akalwadi	CS	Sophomore	Volunteer	Formula SAE
Salman	Alnoman	AOE	Sophomore	Volunteer	Formula SAE
Miguel	Alonso	ECE	Freshman	Volunteer	Formula SAE
Phillip	Andrews	AOE	Freshman	Volunteer	Formula SAE
Roshen	Arun	ENGE	Freshman	Volunteer	Formula SAE
Adeel	Aziz	ECE	Freshman	Volunteer	Formula SAE
Aaron	Bailey	ME	Freshman	Volunteer	Formula SAE
John	Barbish	ME	Grad Student	Volunteer	Formula SAE
Daniel	Bellapianta	ME	Junior	Volunteer	Formula SAE
Prabhav	Bhaumik	ME	Junior	Volunteer	Formula SAE
Parker	Birchard	ENGE	Freshman	Volunteer	Formula SAE
Brian	Blauman	ME	Freshman	Volunteer	Formula SAE
Andrew	Bocklund	ME	Senior	Volunteer	Formula SAE
Gregory	Bolduc	ME	Freshman	Volunteer	Formula SAE
Jess	Bostic	ME	Senior	Senior Design	Formula SAE
Madison	Calicchia	ME	Junior	Volunteer	Formula SAE
Victor	Cappuzzo	ME	Freshman	Volunteer	Formula SAE
Abhilash	Chauhan	ENGE	Freshman	Volunteer	Formula SAE
Ben	Chen	University Studies	Freshman	Volunteer	Formula SAE
Lauren	Chuderewicz	ME	Freshman	Volunteer	Formula SAE
Megan	Clark	ME	Junior	Volunteer	Formula SAE
Andrew	Coe	ME	Senior	Volunteer	Formula SAE
Michael	Collins	ME	Sophomore	Volunteer	Formula SAE
Tucker	Danon	ME	Freshman	Volunteer	Formula SAE
Alec	DeGerolamo	ME	Junior	Volunteer	Formula SAE
Sidney	Dennis	ME	Sophomore	Volunteer	Formula SAE
Michael	DePauw	ME	Senior	Senior Design	Formula SAE

Gregory	DiAngelo	ENGE	Freshman	Volunteer	Formula SAE
Nicholas	DiLauro	ENGE	Freshman	Volunteer	Formula SAE
Nathan	Dodson	ECE	Freshman	Volunteer	Formula SAE
Daniel	Donate-Perez	ME	Sophomore	Volunteer	Formula SAE
Jack	Duffin	ME	Junior	Volunteer	Formula SAE
Joshua	Eager	ME	Sophomore	Volunteer	Formula SAE
Modaser	Ershadi	ME	Junior	Independent Study	Formula SAE
Andrew	Fall	ME	Senior	Senior Design	Formula SAE
Daniel	Flaherty	ME	Freshman	Volunteer	Formula SAE
Paul	Furman	ECE	Senior	Volunteer	Formula SAE
Aayush	Garg	ME	Freshman	Volunteer	Formula SAE
Thomas	Garno	ME	Freshman	Volunteer	Formula SAE
Nick	Gillen	ISE	Junior	Independent Study	Formula SAE
Dennis	Giuliani	ENGE	Freshman	Volunteer	Formula SAE
Bryan	Gomez	ME	Sophomore	Volunteer	Formula SAE
George	Graves	ME	Senior	Senior Design	Formula SAE
Ryan	Greezicki	Building Construction	Freshman	Volunteer	Formula SAE
Masaki	Hada	AOE	Sophomore	Volunteer	Formula SAE
Connor	Hanson	ENGE	Freshman	Volunteer	Formula SAE
Srivatsa	Harish	ME	Junior	Independent Study	Formula SAE
Nathan	Hayes	ECE	Sophomore	Volunteer	Formula SAE
Matt	Hazelgrove	ME	Freshman	Volunteer	Formula SAE
Michael	Hendrickson	ME	Junior	Volunteer	Formula SAE
Ashton	Heng	ME	Sophomore	Volunteer	Formula SAE
Jason	Hess	ME	Senior	Senior Design	Formula SAE
Matthew	Higgins	ENGE	Freshman	Volunteer	Formula SAE
yutong	huang	ME	Sophomore	Volunteer	Formula SAE
Zhilin	Huang	ME	Freshman	Volunteer	Formula SAE
Matthew	Huelsman	ENGE	Freshman	Volunteer	Formula SAE
Trevor	Ierardi	ENGE	Freshman	Volunteer	Formula SAE
Sohil	Jain	CS	Freshman	Volunteer	Formula SAE
Samantha	Jensen	ME	Junior	Volunteer	Formula SAE
Michael	Johnson	ME	Junior	Volunteer	Formula SAE
Jin	Kim	ME	Sophomore	Volunteer	Formula SAE
Joshua	Kintz	ME	Junior	Independent Study	Formula SAE
Daniel	Knott	ME	Junior	Volunteer	Formula SAE
Jeremy	Kochan	ME	Sophomore	Volunteer	Formula SAE
Kent	Komine	Business	Senior	Volunteer	Formula SAE
Isabelle	Kowenhoven	University Studies	Freshman	Volunteer	Formula SAE
Maximilian	Kreuscher	ME	Sophomore	Volunteer	Formula SAE
Qian	Li	ME	Sophomore	Volunteer	Formula SAE
Kenneth	Lin	ECE	Senior	Senior Design	Formula SAE
Ryan	Lucca	ME	Senior	Senior Design	Formula SAE
Evan	Luczko	ENGE	Freshman	Volunteer	Formula SAE
Kevin	Malloy	ME	Sophomore	Volunteer	Formula SAE
Tyler	Martin	ME	Junior	Independent Study	Formula SAE
Benjamin	Masters	ME	Sophomore	Volunteer	Formula SAE
Declan	McDonough	ENGE	Freshman	Volunteer	Formula SAE
Nolan	McGrady	ME	Senior	Senior Design	Formula SAE

Ryan	McKie	ENGE	Freshman	Volunteer	Formula SAE
Joshua	McLevain	ENGE	Freshman	Volunteer	Formula SAE
Noah	McMurrer	AOE	Sophomore	Volunteer	Formula SAE
Zetao	Meng	ME	Sophomore	Volunteer	Formula SAE
Stephen	Merrick	ENGE	Sophomore	Volunteer	Formula SAE
Wade	Miller	AOE	Sophomore	Volunteer	Formula SAE
Daniel	Novak	ENGE	Freshman	Volunteer	Formula SAE
Cole	Oberdorff	Marketing	Senior	Volunteer	Formula SAE
Aidan	O'Neill	AOE	Sophomore	Volunteer	Formula SAE
Sean	O'Rourke	ME	Freshman	Volunteer	Formula SAE
Joshua	Ostrander	ENGE	Freshman	Volunteer	Formula SAE
Nicholas	Pafunda	ENGE	Freshman	Volunteer	Formula SAE
Michael	Perez	ENGE	Freshman	Volunteer	Formula SAE
David	Peterson	ECE	Freshman	Volunteer	Formula SAE
Ben	Pienkowski	ME	Freshman	Volunteer	Formula SAE
Brandon	Pieroni	ME	Sophomore	Volunteer	Formula SAE
Josh	Pinkos	AOE	Junior	Volunteer	Formula SAE
Ishan	Pradhan	ME	Sophomore	Volunteer	Formula SAE
Jason	Price	ECE	Senior	Senior Design	Formula SAE
Nicholas	Principe	ENGE	Freshman	Volunteer	Formula SAE
Nikhil	Reddy	ENGE	Freshman	Volunteer	Formula SAE
Tommy	Remington	ME	Sophomore	Volunteer	Formula SAE
Siyuan	Ren	ME	Sophomore	Volunteer	Formula SAE
Atticus	Rex	ME	Freshman	Volunteer	Formula SAE
Benjamin	Rogers	ME	Senior	Senior Design	Formula SAE
Zach	Rubin	Business	Sophomore	Volunteer	Formula SAE
Wesley	Runnion	ENGE	Freshman	Volunteer	Formula SAE
Zane	Saleeby	ENGE	Freshman	Volunteer	Formula SAE
Mihir	Savadi	ECE	Sophomore	Volunteer	Formula SAE
Daniel	Schiffer	University Studies	Sophomore	Volunteer	Formula SAE
Peter	Schmidt	ME	Freshman	Volunteer	Formula SAE
Weesam	Semaan	ENGE	Freshman	Volunteer	Formula SAE
Haley	Simkins	ME	Junior	Volunteer	Formula SAE
Benjamin	Simons	ENGE	Freshman	Volunteer	Formula SAE
Vignesh	Sinha	Business	Sophomore	Volunteer	Formula SAE
Jamaal	Skeete	ME	Sophomore	Volunteer	Formula SAE
Luke	Slater	BEAM	Junior	Volunteer	Formula SAE
Marissa	Sluss	ME	Freshman	Volunteer	Formula SAE
Garrett	Smith	ME	Freshman	Volunteer	Formula SAE
Jason	Smith	ME	Freshman	Volunteer	Formula SAE
Benjamin	Sosnoski	ME	Senior	Senior Design	Formula SAE
William	Stadtlander	ENGE	Freshman	Volunteer	Formula SAE
Daniel	Stevens	ME	Freshman	Volunteer	Formula SAE
Faaria	Syed	ECE	Freshman	Volunteer	Formula SAE
Amith	Thomas	ECE	Freshman	Volunteer	Formula SAE
Brandon	Thomas	ME	Freshman	Volunteer	Formula SAE
Edgar	Torres	ME	Senior	Senior Design	Formula SAE
Bryden	Tutko	ME	Senior	Senior Design	Formula SAE
Tanner	Uffelman	ME	Junior	Volunteer	Formula SAE

Manideep	Vadlakunta	BIT	Junior	Volunteer	Formula SAE
Thomas	van Opdorp	ME	Sophomore	Volunteer	Formula SAE
Shashank	Vasanth	ECE	Sophomore	Volunteer	Formula SAE
Joseph	Veirs	ME	Senior	Senior Design	Formula SAE
Diego	Villatoro	ME	Junior	Volunteer	Formula SAE
Benjamin	Vogt	ME	Sophomore	Senior Design	Formula SAE
Ryan	Voltz	ME	Junior	Volunteer	Formula SAE
Brandon	Walter	ME	Sophomore	Volunteer	Formula SAE
Dhwan	Wanjara	ECE	Sophomore	Volunteer	Formula SAE
Dhwan	Wanjara	ECE	Sophomore	Volunteer	Formula SAE
Matthew	Watterson	ME	Junior	Independent Study	Formula SAE
Max	Willig	ME	Freshman	Volunteer	Formula SAE
Matthew	Wilson	ME	Sophomore	Volunteer	Formula SAE
Matthew	Woodring	CS	Sophomore	Volunteer	Formula SAE
Adam	Yi	ECE	Junior	Independent Study	Formula SAE
Luis	Yon	ECE	Junior	Volunteer	Formula SAE
Eric	Abradu-Otoo	ECE	Sophomore	Independent Study	HEVT
Matt	Belton	ME	Senior	Independent Study	HEVT
Youssef	Bourdi	ME	Senior	Independent Study	HEVT
Patrick	Braun	ME	Junior	Independent Study	HEVT
Dylan	Butler	ME	Junior	Volunteer	HEVT
Garrett	Campbell	ECE	Junior	Independent Study	HEVT
Heinrich	Curtis	CS	Junior	Independent Study	HEVT
Heinrich	Curtis	CS	Junior	Independent Study	HEVT
Adam	DeAtley	ME	Senior	Senior Design	HEVT
Mohamed	Elleithy	ME	Junior	Independent Study	HEVT
Benjamin	Gross	ME	Sophomore	Independent Study	HEVT
Genevieve	Harms	ME	Junior	Independent Study	HEVT
Dan	Harvey	ME	Grad Student	Volunteer	HEVT
Ethan	Holz	ECE	Junior	Independent Study	HEVT
William	Honicky	ME	Sophomore	Independent Study	HEVT
Eric	Horan	ME	Junior	Volunteer	HEVT
Stephen	Hurd	ECE	Senior	Senior Design	HEVT
Sebastien	Jones	ME	Senior	Senior Design	HEVT
Alexander	Keller	ME	Junior	Independent Study	HEVT
Tae-Hoon	Kim	ECE	Junior	Independent Study	HEVT
Justin	King	ME	Senior	Senior Design	HEVT
Zachariah	Kracht	ECE	Senior	Senior Design	HEVT
George	Krusen	ME	Senior	Senior Design	HEVT
Jack	Layfield	CS	Sophomore	Volunteer	HEVT
Thomas	Legg	ME	Grad Student	Volunteer	HEVT
Candy	Li	ME	Junior	Independent Study	HEVT
Daniel	Lim	ME	Senior	Senior Design	HEVT
David	Lu	ME	Sophomore	Volunteer	HEVT
Kyle	Machel	ME	Junior	Independent Study	HEVT
Clayton	Mangette	ECE	Grad Student	Volunteer	HEVT
Paul	McDaniel	ME	Junior	Independent Study	HEVT
Nicholas	Merkle	ME	Junior	Independent Study	HEVT
Rishit	Modi	ME	Grad Student	Volunteer	HEVT

Olivia	Moldoveanu	ECE	Sophomore	Independent Study	HEVT
Cody	Moss	ME	Senior	Senior Design	HEVT
Nicholas	Newton	ME	Sophomore	Independent Study	HEVT
Julia	O'Brien	ME	Senior	Senior Design	HEVT
Thomas	O'Shea	ME	Senior	Senior Design	HEVT
Austin	Petty	ME	Junior	Volunteer	HEVT
William	Pryor	CS	Junior	Independent Study	HEVT
Ryan	Reynolds	ME	Junior	Independent Study	HEVT
Saam	Rezaei	ECE	Senior	Senior Design	HEVT
Jan Zealine	Saraum	ME	Senior	Senior Design	HEVT
David	Schlingloff	ME	Junior	Independent Study	HEVT
Srikanth	Srinath	ME	Senior	Senior Design	HEVT
Tom	Tase	ECE	Senior	Senior Design	HEVT
Jordan	Thomas	ME	Junior	Independent Study	HEVT
Evan	Thompson	ME	Sophomore	Independent Study	HEVT
Tanner	Troyan	ME	Senior	Senior Design	HEVT
Rohan	Walia	ME	Senior	Senior Design	HEVT
Graham	Wobig	CS	Senior	Senior Design	HEVT
Michael	Zerr	ECE	Junior	Independent Study	HEVT
Daniel	Alex	AOE	Sophomore	Volunteer	HPS
Adam	Bauer	AOE	Freshman	Volunteer	HPS
Jaxson	Bonsall	AOE	Sophomore	Volunteer	HPS
Shane	Carroll	AOE	Sophomore	Volunteer	HPS
Catalina	Castellon	AOE	Sophomore	Volunteer	HPS
Claire	Colvin	AOE	Sophomore	Volunteer	HPS
Matthew	Criss	AOE	Senior	Volunteer	HPS
Garrett	Day	ENGE	Freshman	Volunteer	HPS
James	Duval	ME	Sophomore	Volunteer	HPS
Tyler	Ellis	AOE	Junior	Volunteer	HPS
Matthew	Gertner	ENGE	Freshman	Volunteer	HPS
Peter	Gioia	ME	Junior	Volunteer	HPS
Evan	Grace	ME	Freshman	Volunteer	HPS
Dylan	Guy	ME	Sophomore	Volunteer	HPS
Ahmad	Hassan	ME	Junior	Volunteer	HPS
Clara	Hellersund	ISE	Junior	Volunteer	HPS
Gillian	Hersh	AOE	Junior	Volunteer	HPS
Lauren	Heslop	AOE	Junior	Volunteer	HPS
Nicholas	Hoang	ECE	Freshman	Volunteer	HPS
Madeline	Hower	AOE	Freshman	Volunteer	HPS
Andrew	Jacobs	AOE	Junior	Volunteer	HPS
Oscar	Johansson	ME	Sophomore	Volunteer	HPS
Katelin	Judge	ME	Junior	Volunteer	HPS
Paul	Keller	ME	Junior	Volunteer	HPS
Eric	Kirch	ENGE	Freshman	Volunteer	HPS
Lalitha	Kuppa	CS	Freshman	Volunteer	HPS
Noah	Makley	AOE	Sophomore	Volunteer	HPS
Mason	McCray	ME	Freshman	Volunteer	HPS
Karim	Mohamed	AOE	Sophomore	Volunteer	HPS
Nolan	Pletcher	ECE	Sophomore	Volunteer	HPS

Austin	Pruess	AOE	Sophomore	Volunteer	HPS
Timmy	Riordan	ME	Junior	Volunteer	HPS
Charlotte	Ross	ECE	Senior	Volunteer	HPS
Nicholas	Scianna	AOE	Junior	Volunteer	HPS
Alex	Seidenberg	ME	Junior	Volunteer	HPS
Gwyneth	Steel	ENGE	Freshman	Volunteer	HPS
McKenna	Steele	AOE	Junior	Volunteer	HPS
Phineas	Ulmishek-Anderson	ME	Freshman	Volunteer	HPS
Charles	Welles	ME	Junior	Volunteer	HPS
Kathryn	Wittek	AOE	Sophomore	Volunteer	HPS
Calvin	Woehrle	AOE	Sophomore	Volunteer	HPS
Sam	Wood	ENGE	Freshman	Volunteer	HPS
Emily	Wroblewski	ISE	Sophomore	Volunteer	HPS
Dylan	Adie	AOE	Junior	Volunteer	SailBOT
Robin	Ahlers	ECE	Sophomore	Volunteer	SailBOT
Evan	Allen	ENGE	Freshman	Volunteer	SailBOT
Joshua	Amberg	ENGE	Freshman	Volunteer	SailBOT
Ryan	Anderson	AOE	Sophomore	Volunteer	SailBOT
Jared	Bell	ECE	Junior	Volunteer	SailBOT
Matthew	Brown	ENGE	Freshman	Volunteer	SailBOT
William	Cabell	Mathematics	Senior	Volunteer	SailBOT
Timothy	Ciavolella	ME	Freshman	Volunteer	SailBOT
Blase	Cornett	AOE	Senior	Volunteer	SailBOT
Harry	Crosby	AOE	Senior	Volunteer	SailBOT
Nate	Doggett	ECE	Freshman	Volunteer	SailBOT
Bret	Elphick	ME	Freshman	Volunteer	SailBOT
John	Fuerlinger	ECE	Senior	Volunteer	SailBOT
Andrew	Heller-Jones	ECE	Sophomore	Volunteer	SailBOT
Matthew	Herrity	ECE	Junior	Volunteer	SailBOT
Mohammed	Humadi	ECE	Sophomore	Volunteer	SailBOT
Kevin	Jenks	ENGE	Freshman	Volunteer	SailBOT
David	Kuniholm	ME	Junior	Volunteer	SailBOT
Jimmy	Lane	ME	Junior	Volunteer	SailBOT
Connor	Mackert	ECE	Junior	Volunteer	SailBOT
Sarah	Maxseiner	ECE	Junior	Volunteer	SailBOT
Mateo	McDermott	BEAM	Freshman	Volunteer	SailBOT
Minh	Nguyen	ECE	Sophomore	Volunteer	SailBOT
Omotayo	Oladele	AOE	Senior	Volunteer	SailBOT
Brett	Pollman	ECE	Senior	Volunteer	SailBOT
Aditya	Poudyal	ENGE	Freshman	Volunteer	SailBOT
Jason	Provost	AOE	Freshman	Volunteer	SailBOT
Evan	Quach	CS	Junior	Volunteer	SailBOT
James	Redington	AOE	Junior	Volunteer	SailBOT
Joseph	Reilly	ECE	Sophomore	Volunteer	SailBOT
Ryan	Serafin	ME	Freshman	Volunteer	SailBOT
Ryan	Singman	ECE	Sophomore	Volunteer	SailBOT
Matthew	Soohoo	ENGE	Freshman	Volunteer	SailBOT
Jacob	Valente	BEAM	Grad Student	Volunteer	SailBOT
Philip	Works	ECE	Sophomore	Volunteer	SailBOT

Peter	Antoun	ISE	Senior	Volunteer	SBT
Adam	Caretti	CEE	Senior	Volunteer	SBT
Phillip	Crispell	ENGE	Freshman	Volunteer	SBT
Mary	DiSpirito	CEE	Junior	Volunteer	SBT
Kristen	Ellis	ENGE	Freshman	Volunteer	SBT
Justice	Forster	ME	Freshman	Volunteer	SBT
Justice	Forster	ME	Freshman	Volunteer	SBT
Bradley	Gritz	CEE	Junior	Volunteer	SBT
Gavin	Harwell	ISE	Sophomore	Volunteer	SBT
Sterling	Lamm	CEE	Senior	Volunteer	SBT
Derek	Lawrence	CEE	Junior	Volunteer	SBT
Chris	Padgett	CEE	Freshman	Volunteer	SBT
Ian	Pierce	CEE	Grad Student	Volunteer	SBT
Kayla	Wigle	CEE	Sophomore	Volunteer	SBT
Connor	Willis	ENGE	Freshman	Volunteer	SBT
John	Zeglarski	CEE	Senior	Volunteer	SBT
Shlok	Agarwal	ECE	Sophomore	Volunteer	Undecided
Varun	Modak	ECE	Sophomore	Volunteer	Undecided
Bemnet	Molla	ME	Grad Student	Volunteer	Undecided
Shail	Patel	ISE	Sophomore	Volunteer	Undecided
Yash	Patil	ME	Sophomore	Volunteer	Undecided
Sarang	Rajeev	ECE	Sophomore	Volunteer	Undecided
Brennan	Rausch	ME	Junior	Volunteer	Undecided
Victor	Salanger	Business	Senior	Volunteer	Undecided