



**“Through Senior Design, I got hands-on experience with design engineering, which taught me when to scrap an idea and when to pursue it. Our team learned to weigh the costs and benefits of each of our decisions.”**

— RACHEL TSAO '16  
MASTER'S STUDENT IN  
COMPUTER SCIENCE,  
GEORGIA INSTITUTE OF TECHNOLOGY,  
ATLANTA, GEORGIA

## From the Chair



As chair of the Department of Mechanical Engineering for the last four years, my favorite responsibility has been the exit interviews I conduct with graduating seniors each spring, as they are poised to head out into the world. Over and over again, our students tell me how much they value their experiences in Senior Design, and the guidance and mentoring they have received from the course's dedicated teaching staff. Most characterize it as “the most challenging and rewarding experience I have had during my time at Hopkins.” The capstone of their years of study of mechanical engineering, Senior Design is an opportunity for our students not only to demonstrate a knowledge of scientific concepts, but also to apply their deep understanding of engineering principles to real-world design projects presented by sponsors from industry, non-profits, and governmental organizations. The results of these student projects are nothing short of remarkable—for both students and sponsors. Students get access to sponsors' technical contacts and resources, and learn to work within budgets to create solutions to real problems. Sponsors come away with working prototypes complete with user manuals, specifications, and design histories, not to mention the opportunity to take an up-close-and-personal look at some extraordinarily talented potential employees. Both parties benefit immeasurably.

**LOUIS L. WHITCOMB**

*Chair, Department of Mechanical Engineering*



**“Partnering with Johns Hopkins University allows my team to produce more, brings in fresh perspectives from the students and faculty, and identifies talented young people we'd like to join Stanley Black and Decker. The end product is well worth the investment. A previous year's [project] resulted in a working prototype . . . and we are pursuing patents.”**

— MATTHEW VELDERMAN,  
STANLEY BLACK AND DECKER,  
TOWSON, MARYLAND

**“Senior Design sold me on Johns Hopkins. The chance to work on an engineering project, from establishing requirements to producing a final deliverable, is extremely rare. I learned more practical engineering skills in one year of Senior Design than in all of my other three years combined.”**

— RONALD CASPERS '15,  
ASSOCIATE, STRATEGY&,  
WASHINGTON, D.C.

## Department of Mechanical Engineering **SeniorDesign**

To sponsor a project or for more information, contact Nathan Scott (nscott@jhu.edu) or visit the Department of Mechanical Engineering at [me.jhu.edu](http://me.jhu.edu).



Senior Design 2017

2017 JOHNS HOPKINS ENGINEERING DESIGN DAY



**JOHNS HOPKINS**  
WHITING SCHOOL  
of ENGINEERING



**“My employer was very impressed by the application of electrical, software, and mechanical engineering used in the scope of my project. I currently use all three facets of engineering in my work projects, so the experience made me well suited for the role.”**

—ALEX SCHLINK '16  
DESIGN ENGINEER,  
TOYOTA INDUSTRIAL EQUIPMENT  
COLUMBUS, INDIANA

## Why sponsor a Student Design Team?

### WORKING WITH A STUDENT DESIGN TEAM

provides sponsors from industry, government and non-profit organizations with multiple benefits, from fresh and creative new perspectives on technical challenges to access to engineering professors and the full resources of a world-class university and engineering school.

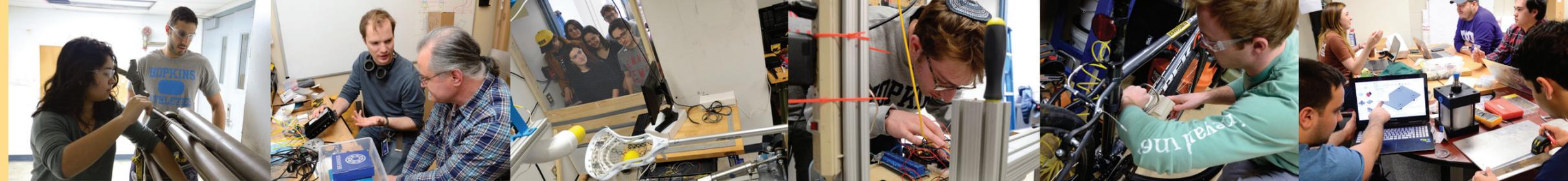
The Senior Design experience is much like an apprenticeship: It fully immerses students in the design process, allowing them to apply the skills and concepts they have learned in the classroom to real-world problems that matter. During the course, students are encouraged to seek out whatever additional training they need and to use our fully equipped Machine Shop and to consult our experts there.

Sponsors tell us that one of the biggest advantages of working with a team is the opportunity to identify top engineering talent (and to observe their problem-solving skills, creativity and teamwork) before these students graduate.

## What is Mechanical Engineering Senior Design at Hopkins?

**THE CAPSTONE PROGRAM** in Mechanical Engineering was founded in 1984, and has graduated more than 1,200 students since then. Each year, we seek out challenging and topically relevant projects that excite and motivate our students and expose them to the complexities of design engineering in the real world.

These problems come from industry, government, and non-profit organizations, and challenge the teams to creatively implement a solution. Our sponsors provide the teams with funds for materials, access to world-class resources, and technical contacts. The students provide sponsors with access to cutting-edge research facilities, as well as to functioning prototypes that not only have gone through the design loop several times, but that also have been tested at the clients' premises.



## Senior Design Day / 5.9.17 current projects

### 1. SPONSOR: AIR FORCE RESEARCH LAB

**Team AFRL:** Members: Avi Gordon\*, Florian Pontani\*, Nick Morton, Max Novick, Ryan Selig, Nastasia Winey

Built a device that allows soldiers to quickly and safely transport a minimum of 350 lbs. across rough terrain.

### 2. SPONSOR: ALLEGION

**Team ALL:** Members: Arturo Brito, Amanda Canezin, Ashley Canezin, Ana Elechiguerra, Samuel Pallay

Researched, built and tested different methods to improve security of electronic door locks against potential thieves.

### 3. SPONSOR: APPLIED PHYSICS LABORATORY

**Team APL:** Members: Zachary Bredl, Sofia Diez, Samuel Einhorn, Emily Hadley, Elizabeth Mark

Developed an exoskeleton that supports the weight of heavy lead vests worn by interventional radiologists, thereby reducing pain in their backs and other joints.

### 4. SPONSOR: JHU CENTER FOR INJURY RESEARCH AND POLICY

**Team BAB:** Members: Matthew Johnson, Danielle Matusiak, Conor Reynolds, Zachary Robbins, Emerson Walsh

Designed and built several CO<sub>2</sub> detection systems that were installed in vehicles to test for the presence of a small infant.

### 5. SPONSOR: BALTIMORE AIRCOIL COMPANY

**Team BAC:** Members: Andrew Backer, Daniel Bregman, Johnathon Yi

Developed a system that would monitor lifespan of components in a cooling tower and predict when failure would occur.

### 6. SPONSOR: EXORISE AND JHU CENTER FOR BIOMEDICAL INNOVATION AND DESIGN

**Team CBID:** Members: Ronann Carrero, Baxter Eldridge, Matthew Gramuglia\*, Suzie Kellogg, Mary Nahill

To reduce the risk of injury to nurses and occupational therapists during patient transfers, the team further developed a motorized knee brace that was originally built by undergraduates in CBID.

### 7. SPONSOR: EAST COAST DYES

**Team ECD-A:** Members: Joseph Peine, Josh Gilbert

Performed an aerodynamic analysis of high performance lacrosse heads using instrumentation and computational fluid dynamics.

### 8. SPONSOR: EAST COAST DYES

**Team ECD-R:** Members: Clara Aranguren, Matthew Bailey, Caitlin Clancy, Anna Goodridge, Erez Krinsky, Alexandre Laloum

Designed and built a robotic mechanism to mimic an elite lacrosse player's throw.

### 9. SPONSOR: FUSIFORM

**Team FUS:** Members: Kiran Jagtiani, Panth Patel\*, Raphael Santore\*

Developed a mechanism to automatically palpate a residual limb so as to identify soft and hard regions to improve prosthetic limb manufacture.

### 10. SPONSOR: JOHNS HOPKINS PEDIATRIC TRANSPORT

**Team JHPT:** Members: Haein Kim, Yadel Okorie, Oludunsin Samuel-Ojo, Jeremy Tsao

Studied the behavior of EMTs during transport calls; specifically, to determine the amount of time EMTs are 'seated and not belted' and 'seated and belted'.

### 11. SPONSOR: KRYPTONITE SCHLAGE LOCK COMPANY

**Team KRPT:** Members: Veronica Boswell, Austin Bridges, David Dominguez, Nathan Green, Jan Hagemeister\*, Evan Holder

Developed a new way to transport Kryptonite's bicycle locks while cycling.

### 12. SPONSOR: PAUL REED SMITH GUITARS

**Team PRS:** Members: Marc Buzelli, Thomas Fiorelli, Elyse Lance, Chris Scherz, Camden Schreeder

Studied several manufacturing processes at PRS and identified three areas where increases in efficiency could be made. Performed case studies and built new wood pressing equipment for one of the identified areas.

### 13. SPONSOR: JOHNS HOPKINS APPLIED PHYSICS LAB AND JHU DEPT. OF EARTH AND PLANETARY SCIENCES

**Team ROCK:** Members: Jimmy Chen, Glen Knight, Patrick Rose, Walter Saine

Built a module to collect micro-meteorites from sub-orbital space flights.

### 14. SPONSOR: STANLEY BLACK & DECKER

**Team SBD-C:** Members: Stefan Arnold, Andrew Bartnett, Brandon Fielder\*, Kevin LeBlanc, Andrew Phipps

Developed a new way to maneuver under a vehicle while doing auto work.

### 15. SPONSOR: STANLEY BLACK & DECKER

**Team SBD-PW:** Members: Sumukh Bharadwaj, Jalen Doherty, Elizabeth Hallenborg\*, Miles McKey, Nic Ulm

Developed a low-powered cleaning system.

### 16. SPONSOR: SPACE TELESCOPE SCIENCE INSTITUTE

**Team STSci:** Members: Cora Dimmig, Daniel Dembner, Blaine Miller

Investigated and mitigated sources of vibration to a highly specialized optics table.

### 17. SPONSOR: U.S. ARMY MEDICAL MATERIAL DEVELOPMENT ACTIVITY AND JOHNS HOPKINS UNIVERSITY MILITARY AND VETERANS HEALTH INSTITUTE

**Team USA:** Members: Sapreen Abbass, Elijah Baum, Emily Mancuso, Natasha Suri\*, Sebastian Yllanes

Developed a system to heat and insulate IV bags and lines against extreme cold temperatures for use by medics on missions in cold environments.

\* Denotes a student assisting a Senior Design Team as part of the junior-level Engineering Design Process class.