

# DESIGNING THE FUTURE

## What is Mechanical Engineering Senior Design at Hopkins?

MORE THAN 1,200 STUDENTS have gone through the Department of Mechanical Engineering's capstone program since its founding in 1984. Each year, industry sponsors' cutting-edge projects motivate and excite our students to explore the challenges of design engineering in the real world.

Our sponsors provide student teams with funds for materials, access to world-class resources, and technical contacts; and the students provide sponsors with functioning prototypes that have gone through the design loop several times and have been tested at the clients' facilities.

The Senior Design experience is much like an apprenticeship: students learn to work in teams, meet deadlines, manage project resources, and apply critical thinking to real problems that matter.

## Why Sponsor?

OUR SENIOR DESIGN PROGRAM has a strong history of collaboration with sponsors from a range of disciplines across industry, government, academia, and nonprofit. Sponsors provide an open-ended problem and our students take the project through the design process to deliver their client an inventive, tangible solution. Projects that sponsors may not have the time or resources to pursue become the top priority of a team of Hopkins engineers.

Sponsors are exposed to the fresh perspectives and creative thinking of the very best undergraduate engineers and Hopkins faculty members. They also get access to a pool of talented potential employees. The capstone Senior Design experience allows students to develop skills and apply concepts that are valued by employers. In return, sponsors get the opportunity to connect with the next generation of leaders in innovation and engineering design. It is a win-win for all involved.



**“For a small cost, ARL gets the chance have engineering students work on a design challenge that is important to our mission and could provide great payback. As a sponsor, ARL helps young engineers coming out of college be much more productive when starting their careers. One major benefit for ARL is that we have hired some graduates and they were ready to jump right in.”**

BRADFORD DAVIS  
U.S. ARMY RESEARCH LABORATORY,  
ADELPHI, MARYLAND



**“Senior Design coursework is focused on theory; going through the process of Senior Design is the most effective way to experience the craft of mechanical engineering from design to production, as well as all the challenges engineers face along the way.”**

NICK MORTON, SENIOR DESIGN ALUM '17  
SOFTWARE AND MARKETING ENGINEER, COGNEX, NATICK, MASSACHUSETTS

**“For my Senior Design team, I was chiefly responsible for FEAs, which I now do for my job. The technical presentation skills I gained in Senior Design, both in reports and in meetings, were invaluable and have definitely helped me excel in my current job where I am expected to communicate results to design teams and document my technical findings in a clear and thorough manner.”**

CAITLIN CLANCY, SENIOR DESIGN ALUM '17  
MECHANICAL STRUCTURAL ANALYST, RAYTHEON, WALTHAM, MASSACHUSETTS

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).

 **JOHNS HOPKINS**  
WHITING SCHOOL  
of ENGINEERING

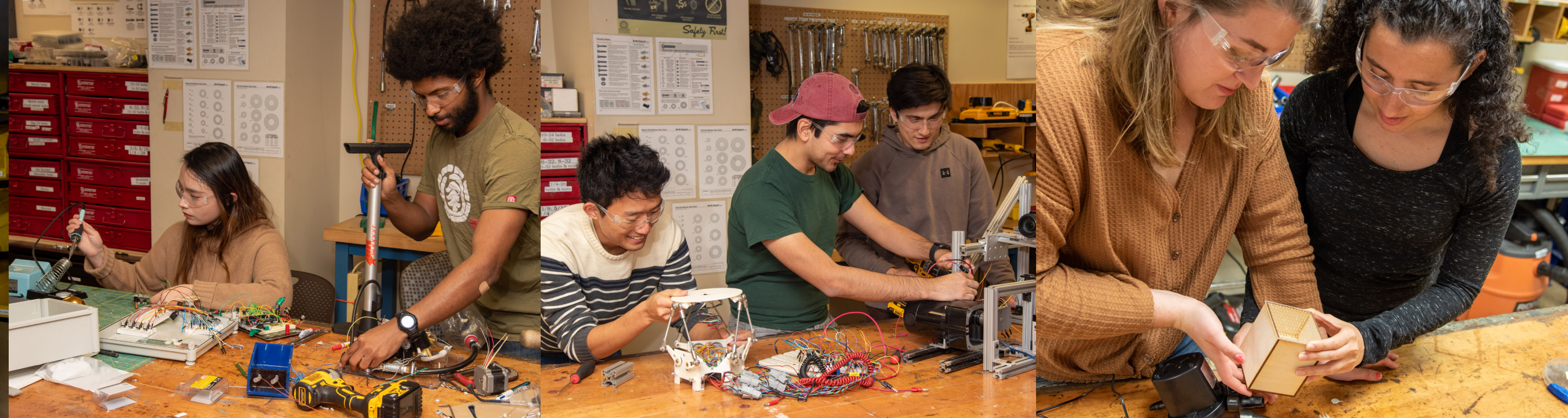


# MECHANICAL ENGINEERING SENIOR DESIGN 2020





# A MESSAGE FROM THE HEAD



“In Senior Design, I was able to gain design experience for mass-produced parts that you simply can’t learn from a textbook. My own successes and failures during the program taught me in nine months what would have otherwise taken years. Senior Design really jump-started my career in product development at Stanley Black & Decker.”

NATE GREEN  
MECHANICAL ENGINEER,  
STANLEY BLACK & DECKER



One thing I hear repeatedly from our mechanical engineering students is how much they value the Senior Design experience, from the opportunity to work with sponsors to the guidance and mentoring they receive 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.

**GRETAR TRYGGVASON**  
**DEPARTMENT HEAD AND CHARLES A. MILLER, JR.**  
**DISTINGUISHED PROFESSOR**  
**DEPARTMENT OF MECHANICAL ENGINEERING**

## SENIOR DESIGN DAY // 2020 current projects

### TEAM ARL

**Sponsor: Army Research Lab**

*Julia Glass, Alex Milner, John Moore*

A disposable, light-weight, modular decoy vehicle to help the Army test autonomous vehicles

### TEAM BOSCH

**Sponsor: BOSCH Security Systems**

*Israel Barrera, Zooey He, Tyler Spoletti*

A custom 6-degree-of-freedom shaker table to test camera image stabilization

### TEAM BISM

**Sponsor: Blind Industries & Services of Maryland**

*Colin Meissner, Lucas Serlin, Seena Vafae, Charlie Watkins*

Vision systems added to a forklift to augment driver awareness of nearby pedestrians

### TEAM GORD

**Sponsor: Johns Hopkins Center for Neuroplastic Surgery**

*John Cai, Cole Clampffer, Caterina Esposito, Justin Kim*

MRI-compatible functional cranial implant for pump-assisted medicine delivery

### TEAM HUR

**Sponsor: Claire Hur Lab at Johns Hopkins University**

*Jalen Nesbit, Eva Pan, Jaime Tebas-Pueyo*

A low-resource, commercial version of Prof. Claire Hur’s hardware that extracts fetal DNA from the mother’s blood for prenatal diagnostics

### TEAM KATZ

**Sponsor: Johns Hopkins Laboratory for Experimental Fluid Dynamics**

*Arion Morshedean, Niles Ribeiro, Chris Williams*  
Measure the deflection of water turbine blades in service

### TEAM MOSQ

**Sponsor: Johns Hopkins Department of Biomedical Engineering**

*Alex Carson, Anna Frazier, Lauren Jacob, Lidia Martinez*

Hardware to take high-quality images of mosquitos for classification

### TEAM OCEAN

**Sponsor: Oceaneering Advanced Tech**

*Randall Elkind, Sammy Hamermesh, Emily*

*Maheras, Harrison Riggott*

Custom hardware to measure net thrust from the combination of a thruster and obstruction

### TEAM SBD

**Sponsor: Stanley Black & Decker**

*Mohamed Elgendi, Thomas Ghebreyesus, Sarah Gunasekera, Stephanie Hernandez, Daniel Hong, +Vishal Kole, +Greg Scott, +Yufu Tao, +Tianyi Weng*

Test rig for snow blowers so that testing is objective and does not depend on the availability of real snow

### TEAM OUSD

**Sponsor: Office of the Undersecretary of Defense**

*Rob Durham, Cesar Saldarriaga, Samson Tessema*  
Rapid cargo loading system for V-22 Osprey aircraft

### TEAM RIPS

**Sponsor: Johns Hopkins Applied Physics Lab**

*Christianna Bambini, Radha Deshmukh, Jacob O’Keeffe, Marcos Perez*

Investigate the feasibility of harvesting energy from the descent of a probe into the atmosphere of Saturn

### TEAM SILENT

**Sponsor: Oceaneering Advanced Tech**

*+Solomon Polansky*

Predict acoustic noise spectrum of a water thruster

### TEAM STSCI-M

**Sponsor: Space Telescope Science Institute**

*Angela Groszos, Mariah Harris, Lindsey Wiser*

A custom, segmented mirror for use in an advanced coronagraph (HiCAT)

### \*TEAM E-KART

**Sponsor: Johns Hopkins Department of Electrical and Computer Engineering**

*Kaiwen Zhang*

Multidisciplinary project to design, build, and race an entry to the EV Grand Prix autonomous electric vehicle competition

*+denotes a master’s student*