



MechE

Senior Design 2018

2018 JOHNS HOPKINS ENGINEERING DESIGN DAY

MAY 8



JOHNS HOPKINS

WHITING SCHOOL
of ENGINEERING



“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

SOFTWARE & MARKETING ENGINEER, COGNEX
NATICK, MASSACHUSETTS

From the Chair



As the new head of the Department of Mechanical Engineering and a newcomer to Hopkins, I have been excited to learn about the Senior Design experience here. Over and over again, students have shared with me how much they value the 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

Head, Department of Mechanical Engineering

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 nonprofits. Sponsors provide an open-ended problem, and our students deliver inventive practical solutions. Projects that sponsors may not have the time or resources to pursue become the top priority for these teams of talented and motivated young Hopkins engineers.

Sponsors consistently tell us that the Senior Design experience gives them a solid return on their investments. Sponsors are exposed to the fresh perspectives and creative thinking of the very best undergraduate engineers—and Hopkins faculty—and a talented pool of prospective 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.



“The Senior Design program mimics real world engineering challenges and constraints beyond textbook knowledge. The scope of the projects are usually very complex, and graduating students demonstrate excellent problem solving, project management and team building skills. Senior Design is an excellent growth experience that gives students confidence in their future.”

GORDON BROWN

SENIOR DESIGN HEAD JUDGE

AMERICAN SOCIETY OF MECHANICAL
ENGINEERS (ASME)



Sponsor Spotlight:

StanleyBlack&Decker

Powerful Tools.

“The capstone project allowed for a good balance of personal freedom, responsibility, teamwork, mentoring, and support. It provided a great introduction to working as a full-time mechanical engineer at SBD. It was a fantastic culmination of my senior year.”

— LUKE MOLOZNIK, '16

Stanley Black & Decker's expertise in breakthrough engineering and product innovation intersects broadly with our Senior Design curriculum, making ours an ideal collaboration that allows Hopkins students to tackle real-world challenges alongside local industry professionals.

A history of support

The partnership between Johns Hopkins University and Stanley Black & Decker runs deep, spanning more than 40 years.

As chief executive officer of the Black & Decker Corporation, Alonzo G. Decker Jr. (1908–2002) led the manufacturing company to international prominence. Decker was a longtime Hopkins trustee and a generous supporter of the Department of Mechanical Engineering, founding a laboratory in Maryland Hall and establishing an endowed professorship. In 2007, in honor of Decker's many contributions, the university opened the Alonzo G. and Virginia G. Decker Quad.

In 2010, Stanley Black & Decker was established, merging two iconic brands to form the world's largest tools and security company. Since then, the company has carried on the late Decker's commitment to engineering education at Johns Hopkins.

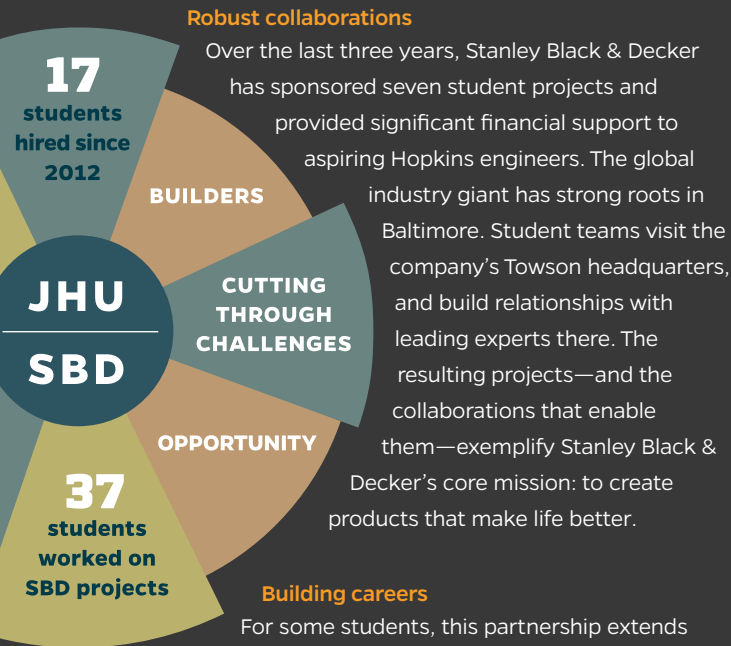
7
student
projects
sponsored

**BREAKTHROUGH
IDEAS**

MAKERS



Powerful Partnership.



Robust collaborations

Over the last three years, Stanley Black & Decker has sponsored seven student projects and provided significant financial support to aspiring Hopkins engineers. The global industry giant has strong roots in Baltimore. Student teams visit the company's Towson headquarters, and build relationships with leading experts there. The resulting projects—and the collaborations that enable them—exemplify Stanley Black & Decker's core mission: to create products that make life better.

Building careers

For some students, this partnership extends well beyond the Senior Design course, with at least 17 Hopkins graduates hired in the past six years. Steve Phillips, VP of Engineering at SBD, says that Senior Design alumni stand out.

"Students bring some fresh, optimistic perspectives. The JHU relationship also brings a set of resources, like professors, advisers, and facilities that we don't have at our company," says Phillips. "One of the biggest benefits, though, is the chance to evaluate potential engineering hires as they work on real Stanley Black & Decker projects."

"Graduates who really engage and dive into a senior design project gain invaluable experience on applying theory and academics to real problems with real constraints. They gain the experience of building something real and presenting the results and learning."

—STEVE PHILLIPS
V.P. OF ENGINEERING
STANLEY BLACK & DECKER



Senior Design Day / 5.8.18 current projects

1. SPONSOR: ALLEGION

Team ALL: Members: Avi Gordon, Matthew Brandes, Matthew Heacock, Brendan Szuwalski
Developed a hands-free door opening system.

2. SPONSOR: APPLIED PHYSICS LABORATORY

Team APL: Members: John Aguilar, Alexander Cohen, Grace Kuroki*, Jonah Muniz, Michael Swiercz

Designed and built an articulated appendage that allows quadcopters to suspend from tree branches of varying sizes.

3. SPONSOR: ARMY RESEARCH LABORATORY

Team ARL: Members: Daniel Jeong, Eugene Kang, Justin Kang, Gabe Maymon, Nate Welsh
Developed a custom gimbal mount for a quadcopter.

4. SPONSOR: DIRECT DIMENSIONS

Team DDIM: Members: Ryan Cummings, Alexander Cohen*, Alexander Doran*, Lucy Reider*, Miranda Grenville*, Stephanie Shirley*
Developed a next-generation version of the photogrammetric scanner.

5. SPONSOR: DIXON VALVE AND COUPLING COMPANY

Team DIX: Members: Emily Bell, Jessica Harsono, Shanaya Herbert*, Natasha Suri
Developed and tested several iterations of a cost-effective, polymer based hose coupler.

6. SPONSOR: ECD LACROSSE

Team ECD-R: Members: Savannah Born*, Jeffrey Goldsmith, Sina Fahimi Hanzaei, Osama Khokhar, Alex Klyuev
Continued work from the 2017 team to develop a robotic lacrosse ball thrower that mimics the motion of a human lacrosse player.

7. SPONSOR: GLOBUS MEDICAL

Team GLO: Members: Max Basescu, Amy Chi*, Jesse Miller, Emily Palmer
Created a robotic rod-bending device for use during spine surgeries.

8. SPONSOR: HOOPERS ISLAND OYSTER AQUACULTURE

Team HIOA: Members: John Chu*, Brandon Fielder, Jan Hagemeister, Davis Knox, Mark Wilson
Developed a modular land-based oyster storage and farming equipment system.

9. SPONSOR: KRYPTONITE - ALLEGION

Team KRPT: Members: Elaine Asare, Huidong (Mona) Gao, Nevena Marinkovic, Guohao Sun
Developed a medium security café lock.

10. SPONSOR: JOHNS HOPKINS SCHOOL OF MEDICINE, DIVISION OF CLINICAL PHARMACOLOGY, DR. SHAPIRO LAB

Team MAL: Members: Rachel Bang, Nick Covone*, Melanie (Gigi) Habiby, Sharon Maguire, Michael Pozin
Improved existing laboratory equipment to allow for multiple simultaneous experiments.

11. SPONSOR: OFFICE OF THE UNDERSECRETARY OF DEFENSE

Team OUSD: Members: David Austin, Amy Boulter, Martha Cervantes, Panth Patel
Designed and manufactured 100 specialized rivet squeezers for use in aviation manufacture and maintenance.



12. SPONSOR: PAUL REED SMITH GUITARS

Team PRS: Members: Brett Caggiano, Kyle Doran, Zachary Jacobson, Connor Joyce

Continued work from the 2017 team to develop a custom automatic fret-pressing system.

13. SPONSOR: STANLEY BLACK & DECKER

Team SBD-F: Members: Elizabeth Konopacki, Magdalene Koo, Nate McIntosh, William Whalen-Bridge

Developed a pressure-measuring system to validate sponsor provided computational fluid dynamics results.

14. SPONSOR: STANLEY BLACK & DECKER

Team SBD-I: Members: Adrian Au, Chinmaya Kuduvalli, Matthew Ma, Gregory Munilla, Florian Pontani, Raph Santore, Daniel Tabas, Jessamy Taylor, Frank Waggoner

Developed a complex system to print large-scale models.

15. SPONSOR: STANLEY BLACK & DECKER

Team SBD-R: Members: Mina Banoub, Joseph Chung, Gavin Granath[§], Duan Li, Paola Donis Noreiga[§], Brian Prats*, Divi Rajput[§], Andrew Ruas, Nagashree Shettigar[§], Tyler Spoletti[§]

Worked on the inaugural multi-disciplinary capstone project to develop a robotic platform for outdoor use.

16. SPONSOR: JOHNS HOPKINS SCHOOL OF MEDICINE, DEPT. OF ORTHOPAEDIC SURGERY, DR. BELKOFF LAB

Team SPINE: Members: Matthew Gramuglia, Elizabeth Hallenborg, Ryan Kunzer, Rachel Rex

Developed a method to detect early signs of pedicle screw pullout during spinal surgery.

17. SPONSOR: SPACE TELESCOPE SCIENCE INSTITUTE

Team STSci-A: Members: Kevin Chang, Abhinav Goyal, Ji Woong Kim, Evelyn McChesney*

Worked closely with world-renowned researchers to develop and install multiple high-precision optical systems on an experimental platform.

18. SPONSOR: SPACE TELESCOPE SCIENCE INSTITUTE

Team STSci-E: Members: Andrew Colombo, Andrew Holliday, Matthieu Le Cauchois, Courtney Schmitt

Developed a large self-sealing enclosure with removable panels for use around an environmentally sensitive optical experimental platform.

19. SPONSOR: JOHNS HOPKINS HOSPITAL, DEPT. OF PATHOLOGY, TRANSFUSION MEDICAL DIVISION

Team TMD: Members: Eric Feldman, Matthew Huhn, Neil McCarter, Poojan Moody

Further designed and developed a temperature-controlled cart to transport blood products from the blood bank to operating rooms.

20. SPONSOR: JHU WHITING SCHOOL OF ENGINEERING MANUFACTURING

Team WSE: Members: Geordan Gutow, Kim Koon*, Stephane Teste, David Samson

Designed and installed a digital system that tracks usage details of manufacturing machines such as mills, lathes, wire EDM, etc.

* Denotes a student in the junior level Engineering Design Process (530.381)

§ Denotes students in the Electrical and Computer Engineering Course – Leading Innovation Design Team (EN.520.251/463/663)



“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
MECHANICAL STRUCTURAL ANALYST, RAYTHEON
WALTHAM, MASSACHUSETTS

“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

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.