

# 2016 UNDERGRADUATE NEWS

Department of Mechanical and Aerospace Engineering



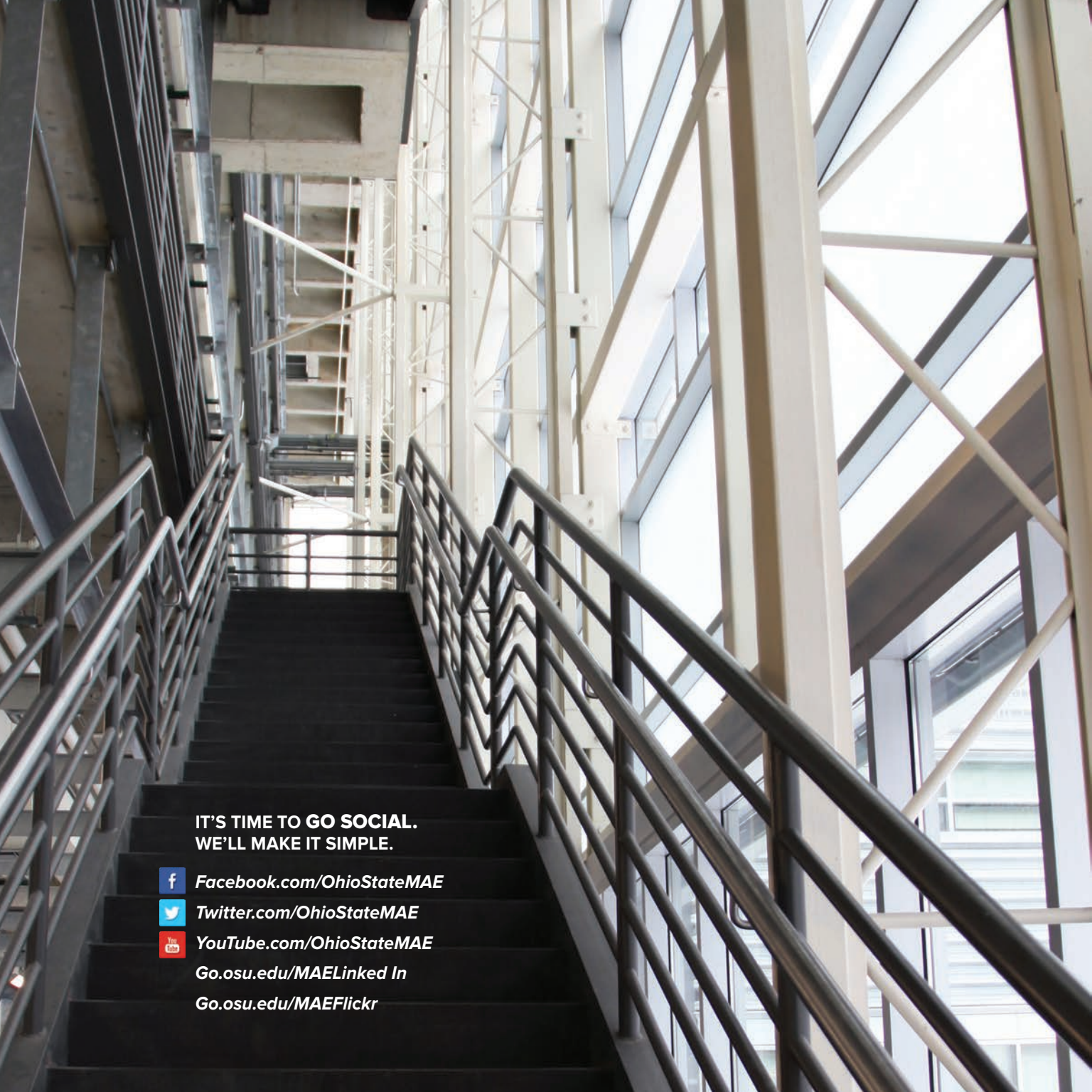
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# Message from the Associate Chair



**Dan Mendelsohn**  
Associate Professor  
and Associate Chair

Department of  
Mechanical and  
Aerospace  
Engineering

Chair, Mechanical  
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In a recent article, “Shaping the Future of Undergraduate Engineering Education,” the author, Bill Odell, discusses trends that are transforming ways higher education is preparing students to solve the world’s greatest science and engineering problems. Among these trends are increased computing power to enhance problem-solving, new tools of exploration and innovation, and the Internet – enabling researchers to communicate with one another almost instantaneously.

Odell, a well-known architect, author and thought leader, observes, “Educational institutions are experimenting with several emerging curriculum and teaching approaches to meet the learning styles of today’s science and engineering students.”

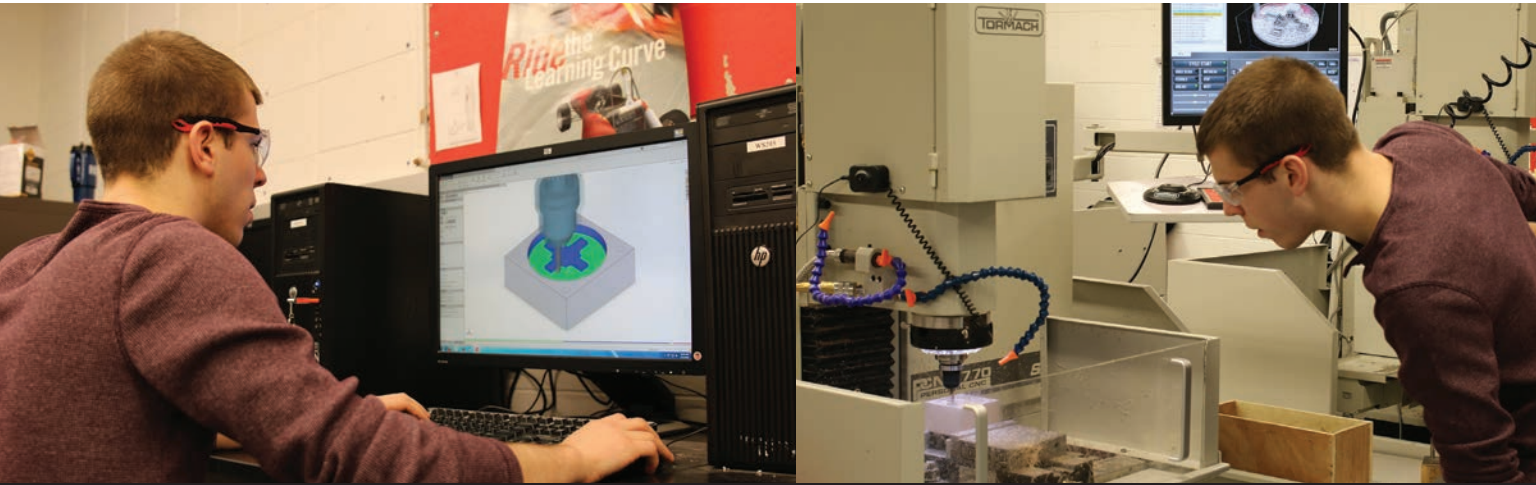
The Department of Mechanical and Aerospace Engineering (MAE) at The Ohio State University takes this responsibility seriously. In this issue of *Undergraduate News*, we report on new advances in our collaborative curriculum, including expansion of experiential learning opportunities, opening up new learning opportunities through the addition of courses outside the engineering major, and the introduction of the professional “soft” skills category as an important step in training future engineers as leaders in their profession and contributors to society.

Our state-of-the-art laboratories support modern teaching methods led by faculty who are globally recognized for their research and innovation and sought after by government and industry. New equipment, technologies and hands-on learning opportunities are reshaping our educational environment and better preparing our students to realize their potential.

Capstone design programs, including those in aerospace and aeronautical engineering noted in this issue, are an integral part of our redesigned curriculum; exemplary examples of how students are engaged in real-world, team-based projects, providing meaningful, hands-on experience that emulates today’s engineering challenges in industry.

And, a focus on our alumni who were greatly impacted as young researchers in our Undergraduate Honors Research Program, reinforces the benefit of interdisciplinary undergraduate education as being critical for students to pursue their passion and ultimately, make a difference.

At MAE, our mission is to place our students first by offering them an unparalleled learning experience and equipping them with the technical and professional skills to be leaders in the engineering profession. Our commitment is to provide them with the opportunity to change the world. ✚



# EXPERIENTIAL LEARNING **UPDATES**

**E**xperiential learning has become more collaborative and innovative than ever before. Engaging students in real-world experiences deepens their knowledge, supports new understanding and extends learning from practical application back to the classroom.

Hands-on learning is spread throughout MAE's curricula, from freshmen engineering project experiences to sophomore design courses in both disciplines to junior laboratory courses and the capstone design and senior laboratory courses, as well as in key technical electives – and we continually add new experiential learning opportunities to the undergraduate program.

In this update, we highlight recent enhancements in equipment and exciting examples of hands-on learning that help make our educational objectives even more relevant and inspiring for students.

Experiential learning enables students to apply abstract technical concepts in concrete practical circumstances. Author Lenor Borzak explains that experiential learning involves direct experience, with the concept being studied rather than just thought about, or involves discussion about possible experience with the concept. (*Field Study: a sourcebook for experiential learning*, Sage Publications, 1981).



## ALL THE RIGHT TOOLS

Funded in part by MAE's Curriculum Development Fund, purchase of new equipment in the classroom and laboratory settings has had a major impact in giving students opportunity to personally work with new technologies. "Technically, what we have to work with today is light years better than what we had previously," said Assistant Clinical Professor Sandra Metzler.

Several of MAE's teaching lab facilities have received upgrades and more are in the works. To date, ten CNC three-axis milling machines, a CNC lathe and a small injection molding machine have been purchased, along with a CNC laser cutter, three Mojo 3D printers and several new power tools for the prototyping shop, including a new band saw, wood shaper and drill press — all of which are being rapidly incorporated into the curriculum of design and manufacturing courses and capstone programs.

A new smart products lab is being developed that will facilitate additional prototyping, automation and electromechanical design capability. The goal is to use these facilities for course specific activities and also properly train students to use these tools in their projects and research activities, including maker related projects, capstone design projects, extracurricular projects and professional society activities such as design competitions. In the Maker/Hacker-oriented culture, these technologies help promote entrepreneurial and creative approaches, supported by the university.

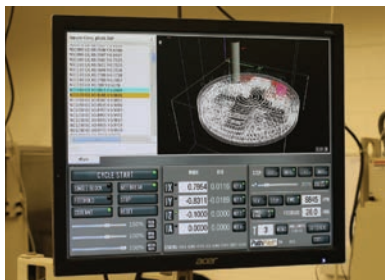
"With the addition of new technologies, we are tying in theory and practical application so students see the impact from a design application perspective," Metzler commented. "The payoff is that going into industry, students have had the hands-on experience, not just engineering science."

## NEW TOOLS ENHANCE CAD/CAM COURSE

The purchase of these tools and technologies has been complemented by the generous donation of two robotic education cells from Lincoln Electric. The expanded range of fabrication and prototyping capabilities provided by these tools has been incorporated into a major redesign of the senior and graduate level Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) course, where students gain expertise in product design using SolidWorks 3D modeling software to create different products and components. This section of the course also gives students the knowledge and skills required to complete the first level of SolidWorks certification, which also serves as the final exam for the course. Students submit a selection of models created from concept to reality using the full range of fabrication and prototyping tools. Through this process, they learn how decisions made in the design phase affect how a product can be fabricated, and they can evaluate the capabilities of the prototyping and manufacturing method on design.

The CAD/CAM course has always been a popular technical elective, but as the capabilities of the associated lab facilities have expanded, the course enrollment has more than doubled; from 40 students to 84 students in one year. A team of graduate and undergraduate teaching assistants help ensure student safety in the lab and provide feedback. The classroom portion of the course has been moved to Scott Lab's largest

computer lab facility to provide a more engaging learning environment. Students actively work in the SolidWorks software environment in real-time as the design concepts and methods are presented and discussed. ✿



# The Maker Movement

## Metzler Brings Maker Movement to MAE

Hands-on learning is also a hallmark of the maker movement, an international initiative bringing communities together to create new products and services, which made its debut at Ohio State in 2014. Makers are developers, entrepreneurs and inventors who take experiential learning to a new level, applying their own unique creativity.

“The maker community has at its heart the ability to take and use technology for their own purpose,” Metzler said. “Ohio State is doing this at a very high level and integrating it into course work, and there is a group of students and faculty who support it.”

Numerous student and university groups such as the Electronics Club, Buckeye Hackers, Open Source Club, STEP activities, as well as OHI/O Hackathon and Makeathon activities on campus are a source of engaging students outside of the classroom. Metzler is the faculty advisor for the OSU Maker Club, which collaborates with similar clubs at Ohio State. Professor Steve Bibyk, faculty advisor for the Electronics Club, says open lab and studio space is difficult to come by, so the Electronics Club works with industry sponsors of the Hackathon and Makeathon to hold workshops with access to lab/studio training before and after each event. “These student-driven events also bring student groups together in developing a tech culture at Ohio State,” Bibyk noted.

Hosted by Ohio State’s College of Engineering, Computer Sciences and Engineering and the University Libraries, the 3rd annual 24-hour OHI/O Hackathon, held last November at Ohio State’s Ohio Union, hosted more than 500 undergraduate and graduate students from Ohio State and other Midwest schools who developed projects and prototypes that involved aspects of computer programming and control devices, and demonstrated them to a live audience of students, faculty and tech company representatives. The event has grown exponentially from 200 students in 2013. Students competed for over \$5,000 in prizes and projects were judged in categories including technical difficulty, creativity, usefulness and presentation. Dozens of industry professionals interested in the talent and technology on



*1st Place: Park Side of the Moon — Zach Saylor, Taylor Case, Kiran Bangalore, Ritvik Vasudevan.*



*Fuse Challenge: The Crazy Mongoose — Carlos Alcazar, Kevin Turner, Venix Cadot (Unpictured: Shuming Chan).*



*Esri Challenge: Code Busters - Geet Tripathi, Allison Salach, Alberto Romanach (Unpictured: Emily Reed)*

display also attended. Sponsors included Ohio State's Wexner Medical Center, Google, Battelle and Rockwell Automation, among many others.

Eric Bauer, co-organizer and Electronics Club president said, "We had a lot of universities come together, a lot of great projects and I don't think it could have turned out any better."

Assistant Professor Arnab Nandi, Ohio State Computer Science and Engineering, and Meris Mandernach, head of Research Services with University Libraries, are co-directors of the OHI/O program. "OHI/O is a grassroots effort that is growing rapidly across campus and beyond," said Nandi. We are excited about the maker movement becoming a long-term, sustainable part of Ohio State's cultural fabric."

Metzler says the point behind the OHI/O Hackathon and the Makethon is focusing students toward solving real-world problems and using that technology to advance society. "The Hackathon and Makeathon are great events that give students the opportunity to use their creativity. They can do it on their own and get excited about using technology as a tool, but they can also give back," she said.

The integration of efforts and projects across these organizations reinforces the multidisciplinary environment of real-world engineering projects, which students will encounter professionally. ✚

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*Ohio State is doing this at a very high level and integrating it into course work, and there is a group of students and faculty who support it.”*

— SANDRA METZLER, assistant clinical professor

# New and Innovative

## Whitfield Advises Exemplary Aeronautical and Astronautical Capstone Design Teams

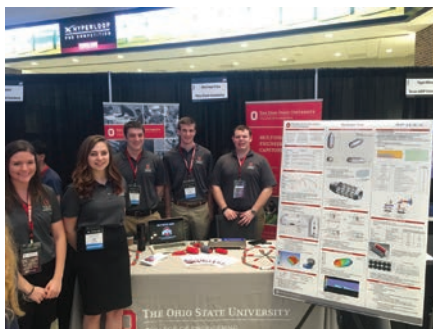
### HYPERLOOP TEAM

In January, the Ohio State Hyperloop Multidisciplinary Capstone project team that includes six aerospace engineering students and several engineering physics and mechanical and materials science

and engineering students, traveled to Texas A & M University to compete in the annual Space-X Design Competition. The Ohio State team was selected in October from over 300 university teams from 20 countries, and was comprised of both undergraduate and graduate students. Their project advisor, Assistant Clinical Professor Clifford Whitfield, was nominated by his students as a faculty judge for the competition and was subsequently selected by Space-X to represent Ohio State.

The main focus of the project was to reduce drag on a vehicle that can overcome a wall of pressure while traveling at great

speeds. The team solved the problem by using air ejectors to influence air flow – a method used by corporations in testing engine intake designs. They found a new way to entrain the air flow with a battery cooling system utilizing Graphene to reduce the weight and increase thermal dissipation around battery cells. It worked. "We are immensely proud of the way this team represented the department and Ohio State," said Whitfield. ✚





## AIR FORCE RESEARCH LABORATORY TEAM

A team of five aerospace engineering students identified an Air Force Research Laboratory and Ohio Aerospace Institute sponsored capstone project opportunity. With assistance from Whitfield as advisor, the team exclusively developed and submitted a proposal and they were subsequently selected as a sponsored team.

A modular Unmanned Aerial Vehicle (UAV) engine air particle separator is being developed, built and tested to prevent dust from reaching the engine compressor face while maintaining safe engine operation. The primary focus of the project is to design a particle separator in order to maximize particle separation efficiency while minimizing pressure loss, with secondary objectives that include measuring engine intake pressure distortion and computational analysis of erosion and drag. ✚



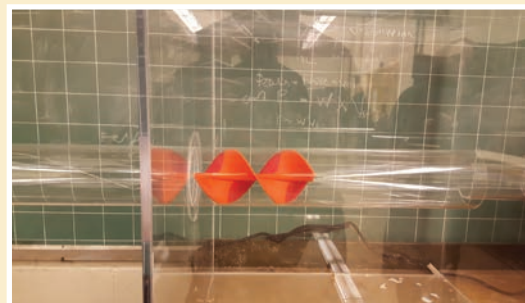
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*Experiential learning in the real world adds value to both the employee and the employer, given the increasing need to close the skills gap between employers and workforce in many parts of the world.”*

## RETURN ON INVESTMENT

Jason Ma, a contributing writer for *Forbes* magazine writes, “Without a sound combination of mind-set, skill set, direction, strategies and effective execution, students may be disappointed in their ‘admit rate’ to choice companies.” Ma observes a trend in the rising usefulness and impact of experiential learning that complements the curricula of more traditional college and university campuses. “Employers want to know that students can apply their knowledge to the real world,” he said. “Experiential learning in the real world adds value to both the employee and the employer, given the increasing need to close the skills gap between employers and workforce in many parts of the world.”

Metzler and Whitfield couldn’t agree more. Through their efforts and those of their colleagues, dedicated to bringing experiential learning into the curriculum, we are ensuring that our students are equipped with the technical and professional skills to excel in the engineering profession. ✚





# MAXIMIZING POTENTIAL

Over the past two years, three new multidisciplinary programs (two minors and one honors program) have been created for undergraduate engineering students, facilitated through collaborations with Fisher College of Business, the Department of Design and the John Glenn College of Public Affairs. Undergraduate engineers are teaming with students outside of engineering to gain experience in entrepreneurship, business skills, problem solving and policy issues.

## Entrepreneurship & Innovation Minor

### From ideation to commercialization

The launch of the Entrepreneurship & Innovation Minor followed the January 2015 announcement of a new Center for Innovation and Entrepreneurship at Ohio State's Fisher College of Business as a university-wide initiative providing opportunities for discovery, research and student learning.

Offered through a collaboration between Fisher College, the College of Engineering (COE) and the College of Arts and Sciences (Department of Design), the Entrepreneurship & Innovation Minor provides undergraduate students from multiple disciplines with a core understanding of entrepreneurship, innovation and idea generation. Students completing the minor have the ability to apply critical thinking skills and cross-disciplinary, collaborative problem solving in creation of successful new ventures, products and services – important skills in today's increasingly competitive environment. ✚

Visit [go.osu.edu/emminor](http://go.osu.edu/emminor) to learn more.



### Student Impact

In fall Semester 2015, 69 of 222 students enrolled in the Entrepreneurship & Innovation Minor had a primary major in engineering, and 21 of those (30 percent) are mechanical and aerospace engineering students.

# Integrated Business & Engineering Honors Program

## Developing “T-shaped” engineers

There is an increasing demand from industry for engineers with both a solid technical background and business, communications and professional skills, referred to as “T-shaped” engineers. The vertical position of the “T” symbolizes narrow and deep technical knowledge and the crossbar represents broader knowledge, including the ability to work in multidisciplinary teams.

The COE, in partnership with Fisher, offers a unique program, the Integrated Business & Engineering (IBE) Honors Program, to meet this growing need. The program offers 36 honors students the opportunity to participate at a very high level to reach their full intellectual and personal potential.

Amanda Crall, academic advisor, says the program is designed to develop a multidisciplinary approach to problem solving. “We’re giving students a competitive edge by developing skills required in engineering and in business,” she said. ✚

Go to [go.osu.edu/honorsprogram](http://go.osu.edu/honorsprogram) for more information.

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*We’re giving students a competitive edge by developing skills required in engineering and in business.”*

— AMANDA CRALL, academic advisor, IBE Honors Program



*Under the direction of Georgia Pacific's Shellie Caudill, first-year IBE students practice brainstorming methods leading to a prototype of an innovative backpack during a voluntary evening workshop.*



## Student Impact

There have been three IBE Honors Program Cohorts, the first of which (2013-2014) are currently juniors. Sixteen engineering students will graduate from the program next year. Of the 36 students in the freshman 2015-2016 Cohort, 22 are engineering students and five are mechanical or aerospace engineering majors.



## Science, Engineering and Public Policy Minor

### Inspiring citizenship, developing leadership

The John Glenn College of Public Affairs, in collaboration with Professor J. Bielecki jointly of the Glenn College and the Department of Civil, Environmental and Geodesic Engineering, now offers a minor in Science, Engineering and Public Policy, which introduces students to the governmental roles and responsibilities around science, engineering and innovation. National security, healthcare, energy, environment and transportation are supported by government funding. Standards, regulations, patents, inventions and medicines are determined by public policy – and science influences outcomes.

Professor and Ohio Eminent Scholar Bharat Bhushan, also an Affiliated Faculty Member of the Glenn College, is leveraging his recent time on Capitol Hill as an ASME Science and Technology Policy Fellow by letting the future engineers and scientists at Ohio State know they can have an impact on public policymaking. Bhushan believes it is critical that engineers become involved with policymaking to influence lawmaking at the state and federal levels. “Engineers cannot remain outside the political process,” Bhushan said. “Their expertise is needed to ensure that technical policy is crafted to do the most good.” The Engineering and Public Policy Minor provides a strong step in that direction. ✚

Learn more at [go.osu.edu/glennsepp](https://go.osu.edu/glennsepp)

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*Engineers cannot remain outside the political process. Their expertise is needed to ensure that technical policy is crafted to do the most good.”*

— BHARAT BHUSHAN, professor  
and Ohio Eminent Scholar



# Integrating Professional Development Skills

A key feature of the revised Mechanical Engineering Technical Elective (TE) program is the addition of a professional skills category from which students may count three credit hours toward their 12 credit hour TE requirement.

The category teaches skills and knowledge not directly related to technical engineering content, but critical to functioning in the modern engineering world. These skills are exemplified in the Accreditation Board of Engineering and Technology (ABET) student outcomes, which address teaming, professional and ethical responsibility, communications and the global, economic, environmental and societal contexts of engineering.

Through extensive feedback from our alumni, business skills such as entrepreneurship, project and system management and an understanding of organizational economics are also critical for today's practicing engineer and are included in the professional skills category.

Students are introduced to engineering ethics through a general education requirement and are also required to take a course in engineering economics. Professional skills courses give students experiences in leadership at the organizational level, global leadership, accounting, product development, project management and Lean Six Sigma.

Additional offerings include engineering law, entrepreneurship, public policy and engineering, and a course in humanitarian engineering which covers engineering design issues specific to projects in developing countries. Many of these courses are new — developed specifically for the TE program.

One such course is "Innovative Leadership for the Global Leader." We sat down with the course developer, Maureen Metcalf, to learn more.



## INNOVATIVE LEADERSHIP FOR THE GLOBAL LEADER

The future holds significant challenges for the engineering profession, many of which are inherently global and culture specific. Metcalf, a private leadership consultant, believes it is critical that engineers be equipped with “soft” skills in order to succeed in the engineering profession. “I work with many engineering clients and those who succeed have both strong technical skills and strong self-awareness and interpersonal skills,” she said. “It is the combination that makes for really strong performers.”



### Specifically, how does your course play into the bigger picture?

One class session is dedicated to looking at overall futurist work – where we are going as a society over the next decade. We listen to interviews from top researchers about what makes the best and worst leaders. Through thoughtful conversation in class, students begin to understand that in times of significant change, they need to stay on top of trends not only in their industry, but in other industries that could disrupt what they are doing. I believe this exposure gives them a heightened awareness of the importance of understanding and successfully managing changing trends.

### How is the course helping students gain a broader perspective?

Most students are graduating seniors and the course helps them think about how they position themselves for the future. *The Innovative Leadership Workbook for College Students* walks them through a series of exercises starting with personal vision and values, which serve as a foundation for their future choices. For many students, this is a great time to start shifting focus from getting through school to thinking in depth about the contribution they want to make to the world and the type of lives they want to lead.

### What impact will this course have in preparing next-generation engineers?

One of my clients is a 700-person engineering firm. The employees who perform best are those who can work across offices, disciplines and sectors. They have mastered technical skills and also function well within teams of people who are different than they are. This is where “soft skills” make an impact. Much of what my students learn is how to work through these challenges. After identifying vision and values, students assess themselves by personality type, leadership maturity, resilience and behavior. They create development plans and identify support teams to accomplish their

goals and begin to develop sensitivity to different cultures – many of which are globally diverse – as well as self-awareness and other skills associated with career and personal success.



The fact that the department added the professional skills category is a strong statement that they understand the importance of these skills, in addition to technical engineering skills. In an economy currently experiencing massive change, we need to equip our graduates with the capacity to

anticipate and navigate the challenges they will face. I am personally really honored to be included in this program, working with such talented students. ✨

*Metcalf is CEO of Metcalf & Associates, Inc. and author of a nine book series, the Innovative Leadership Fieldbook, winner of a 2014 International Book Award. With more than 30 years of business experience, she is widely recognized as a principled thought leader who has pioneered a groundbreaking approach to leadership development and organizational change.*

# UNDERGRADUATE HONORS RESEARCH

## Paving the Way for Future Engineers

**A**t MAE, the student experience is our first priority. According to Associate Professor Rob Siston, Honors and Undergraduate Research Program Coordinator, undergraduate research exemplifies our mission of placing students first. “The Undergraduate Honors Research Program has great benefits for students and faculty alike,” Siston said. “Undergraduate research gives students the opportunity to work one-on-one with faculty to enhance technical and professional skills in ways not possible in a traditional course.”

We spoke with two alumni and a graduating senior who say their experience as young researchers gave them the confidence to pursue their passion, hands-on experience – and a competitive edge.

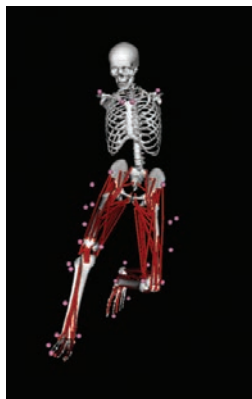




# Preventing Illness and Injury in Sports and Exercise

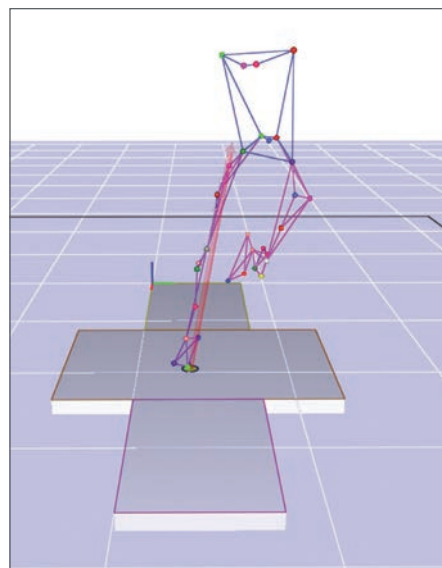
## Understanding biomechanical risk factors for anterior cruciate ligament (ACL) injury

According to Julie Thompson, postdoctoral scholar in the Human Performance Lab (HPL) at Stanford University, her undergraduate research in MAE's Neuromuscular Biomechanics Lab was the catalyst for her ongoing interest in biomechanics. Thompson says she still uses the skills learned in her current research at Stanford, where she supports the mission of the HPL and its function within Stanford Sports Medicine and the Department of Orthopaedic Surgery. "I ask questions and seek out answers and greater understanding with the tools and knowledge I gained as a young researcher," she said.



Thompson earned a bachelor's degree from MAE in 2008, and then pursued a master's degree and PhD from Ohio State. Her master's thesis focused on a computational simulation of the effects of total knee arthroplasty component malrotation, and her interest in understanding the impact of knee injury and disease continued into her PhD work, where her dissertation asked the question of how weakened quadriceps affect the function of muscles in the lower extremities during walking.

But Thompson credits her undergraduate research experience with her continued desire to pursue the field of biomechanics. "My undergraduate honors thesis was the design, construction and validation of a cadaver knee motion testing device for the purpose of investigating the effects of surgical procedures on knee kinematics," Thompson explained. She gained experience in the machine shop to fabricate



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*I ask questions and seek out answers and greater understanding with the tools and knowledge I gained as a young researcher,”*

her device and honed her knowledge of kinematics, design, machine element theory and computer programming. The project earned her an academic scholarship and an internship, and she ultimately won a National Science Foundation Research Fellowship – which provided the majority of her graduate school funding.

"Pursuing undergraduate research was one of the most transformative experiences of my undergraduate years," Thompson said. Her advice to students considering undergraduate research? "Do it...it will be an experience you won't regret." ✚

# Detection of solid cancers and morphological differences in biological tissue

## Microscopic eddy current detection of abnormal biological tissue

**A**s the first undergraduate student to receive a Pelotonia Undergraduate Fellowship in 2015, Josh Javor is grateful. “This fellowship will have a great impact on my research because I have direct access to Ohio State University’s leading researchers,” he said. Founded in 2008, Pelotonia was established with the objective to fund life-saving cancer research. Javor rode 180 miles in the three-day cycling event last summer, describing it as an “incredible experience.”

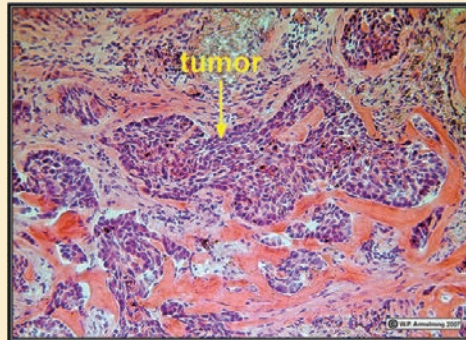
Javor will graduate with a bachelor’s degree in mechanical engineering in spring 2016. His undergraduate research focus is on cancer detection by using a modified detection method, eddy current detection, currently used in welding to identify defects in conductive materials such as metals. The

fellowship project applies similar technology to detect abnormalities in human tissue by designing and fabricating a microscopic detection tool based on macroscopic prototypes to improve resolution.

Javor’s first project was to design, fabricate and model (in MATLAB) a dual axis, two-coil system. His second project was to characterize the input/output of a lock-in amplifier (signal filter) used to magnify small changes in the signal response from that system.

“Undergraduate research has improved my ability to understand, communicate and utilize high level technical knowledge to make an impact on science,” Javor commented. He believes he is uniquely prepared to enter the workforce. “Companies want students who can independently work through problems and communicate complex ideas,” he said.

When asked what advice he would share with students considering undergraduate research, Javor says students should get involved by seeking out professors whose research topics interest them, put the time and effort into research and fully utilize resources available, such as finding a mentor. “Have fun and encourage others to have fun too!” ✚

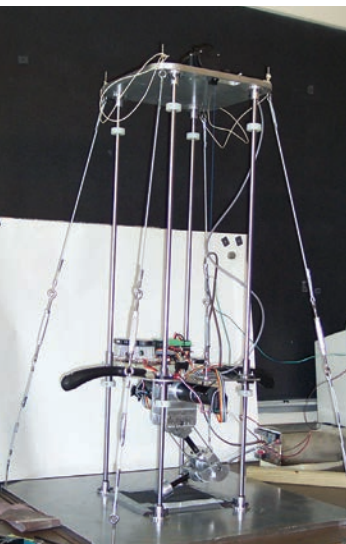
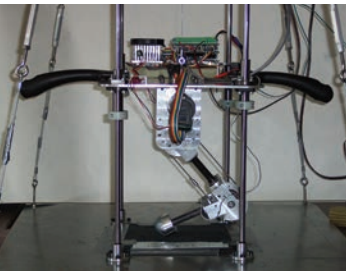


“*This fellowship will have a great impact on my research because I have direct access to Ohio State University’s leading researchers.*”

# Investigating Dynamic Maneuvers in Legged Robotics

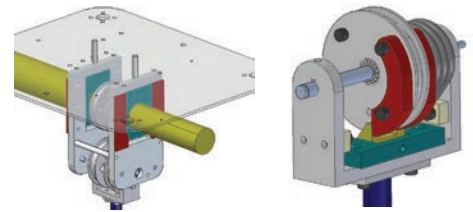
Design of the Rocket Booster Hydraulic Systems for the *New Shepard* Launch Vehicle

At Blue Origin, an aerospace developer based in Seattle, Washington, the hiring bar is set very high for people passionate about space exploration, at the top of their field and excited about shaping the future in space.



Brian Knox, who earned his bachelor's and master's degrees in mechanical engineering at Ohio State, is one of those individuals. As a mechanical systems design engineer, he is responsible for the design, fabrication and testing of several of the critical flight control systems on the *New Shepard* launch vehicle, which is Blue Origin's fully reusable suborbital rocket. He has primarily worked on the rocket booster hydraulic system that powers the flight control surface actuators, including fins, drag brakes and landing gear. He also worked on developing the thrust vector control actuators for the crew capsule escape system, which is built around a 70,000lb thrust solid rocket motor. Last January, the *New Shepard* vehicle successfully completed its second flight to space and back.

Knox's undergraduate research focused on investigating dynamic maneuvers in legged robotics, such as jumping and running. He worked on upgrading a prototype leg for increased strength and reliability to be used for evaluation of different jumping control schemes. He also developed a dynamic system model of the leg to help analyze and identify important parameters for effective jumping control.



“Undergraduate research provided me a great opportunity for participating in a hands-on design and build project that involved actual hardware in a collaborative team setting.”

“Undergraduate research provided me a great opportunity for participating in a hands-on design and build project that involved actual hardware in a collaborative team setting,” Knox said. “The robotics experience opened me up to the area of mechatronics, which provided a fundamental basis for design in a world where mechanical and electrical systems are intricately coupled.” Knox believes employers are looking for this type of experience.

Knox strongly encourages students to consider undergraduate research. “It’s an opportunity to explore an engineering subject that may interest you more in-depth, while developing skills that will serve you well in graduate school and throughout your career.” ✚



# Research and Design Day

A hallmark of MAE's undergraduate program is its multi-faceted capstone design projects, prime examples of experiential or applied learning in the classroom; however, design projects are not confined to the senior year. Sophomores gain understanding of the major interest areas and typical problems encountered in the mechanical engineering discipline through a combination of classroom and hands-on laboratory experiences centered on the manufacturing and control of a compressed air motor, as well as an open-ended mechatronic design project. Juniors learn the fundamental principles of selected machine elements such as linkages, fasteners, springs and gears in the classroom and culminate the two semester series with a paper-based design project, which last year involved designing educational exhibits appropriate for Columbus' Center of Science and Industry (COSI).

Prior to last year's inaugural Design Day, there was little opportunity for students or faculty to see design examples across the curriculum. In early 2015, several faculty discussed potential remedies which grew into the Design Day idea, where students could showcase their projects to other students, faculty, staff, visiting advisory board members, companies and the general public. As a result, last April, dozens of student design teams lined the halls of Scott Lab, eager to share examples of their work ranging from Arduino-controlled air motors to spring-loaded basketball-shooting cannons to receptacles for feminine care products.



The first Design Day was a big hit. "Students work really hard on their projects," said Rob Siston, associate professor, who originally came up with the idea. "It's a chance for them to show what they can do." Students appreciated the day as well. "Design Day was a great opportunity for us to showcase our machine elements projects and preview what we will experience this year in capstone," said Mitch Eichler, a senior in mechanical engineering.

Faculty supported the event by encouraging students to participate in conversation and in their classes. As "experimentalists," their goal was to evaluate what worked last year and make this year's event bigger and better.

"Design Day was a celebration of our students' innovation that exemplifies the philosophy of hands-on learning," Siston said. "We are passionate about inspiring our students to make an impact."

*“We are grateful for and acknowledge those who have supported the ME Honors Fund to create increased opportunities for our aspiring undergraduate engineering students.”*

– AHMET SELAMET, professor & chair, Department of Mechanical and Aerospace Engineering

The success of last year’s event prompted an expansion of activities in 2016 to further recognize student achievement and include undergraduate research activities. In addition to the undergraduate student teams from last year who will present in 2016, both undergraduate and graduate student teams will present their design projects from two popular classes taken by seniors as technical electives or by master’s students; one-on-one product design engineering and computer-aided design and manufacturing.

An even bigger addition is an undergraduate research symposium that will highlight students’ ingenuity and creativity. Selected students will give short, technical, oral presentations about their research for an opportunity to win cash prizes.

For both aspects of the event, faculty want to engage outside audiences, such as alumni, college freshman who may be undecided about engineering, high school students who have an interest in engineering and companies who may be looking for summer interns or potential employees, or who may have interest in sponsoring a capstone design project.

“MAE’s undergraduate research program is the largest within Ohio State’s College of Engineering with a proud history in design,” Siston commented. “Research and Design Day is an opportunity to publicly recognize student accomplishments in both areas.” ❀

## ME HONORS FUND SUPPORTS NEW FEATURES

In addition to the undergraduate research symposium to be launched at Research and Design Day on April 22, 2016, new perks for students are in the works:

- Research grants to fund equipment and supplies – gain practical experience in proposal writing and budgeting
- Lifelong learning enrichment grants – do something you’ve always wanted to do or fix a problem in your life
- Conference support for undergraduate research projects – attend a conference in a student’s chosen discipline



**NEW AND IMPROVED!**  
**2016 RESEARCH AND DESIGN DAY**  
**APRIL 22, 2016**



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