

PURDUE ENGINEERING HONORS

# *ANNUAL REPORT*

& GOSS SCHOLARS PROGRAM



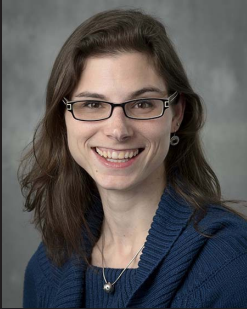
**PURDUE  
UNIVERSITY®**

COLLEGE OF ENGINEERING  
HONORS & GOSS SCHOLARS PROGRAM



# WELCOME

From Dr. Jacqueline Linnes



As a Purdue student 20+ years ago, I changed my major (CODO'd) into the College of Engineering during my sophomore year a result of taking an Engineering Honors Course – Zero-Gravity Flight Experiment. I originally joined the program that is now Exploratory Studies with no particular plans to become an engineer (creative writer, science teacher, and medical doctor were top of my list at the time). However, after taking this honors course with hands-on experimenting, designing and prototyping, and the opportunity to test our solutions on the NASA microgravity “Vomit Comet” and experience the weightlessness of astronauts at Johnson Space Center in Houston, TX, I was completely hooked. I knew that becoming an engineer would allow me to combine my passions in creativity and design with technical expertise in math and science to solve critical societal problems. Purdue Engineering was where I wanted to be, and I could not have found this passion without the opportunities provided by the Engineering Honors Program.

Years later, as the Marta E. Gross Associate Professor of Biomedical Engineering, I have the distinct pleasure to be faculty here at Purdue and the Director of the very program that I benefited from; I now get to work with the next generation of aspiring engineers. Our Engineering Honors & Goss Scholars students are top students in Purdue's College of Engineering and many are also enrolled in the John Martinson Honors College. Goss Scholars bring an intense desire to take their engineering degree above and beyond by engaging in interdisciplinary academics, leadership development, community & global engagement, and undergraduate research. I hope that each of our Goss Scholars has this same inspirational experience where they are challenged, nurtured, and strengthened to cultivate their best selves in service to improving societies biggest challenges.

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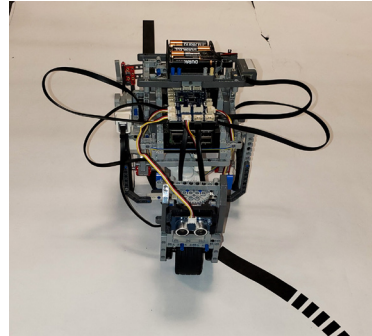
# **ENGR 16100 PROJECTS**

## **Project 1**

In the first engineering design challenge, teams are tasked with creating a catapult from common household materials. The catapult is scored based on its accuracy (hitting a target), effectiveness in throwing a long distance, and efficiency of design materials. Students learn basic physics principles, along with aspects of the engineering design process (particularly challenges associated with conflicting design goals) and professional communication, and reporting.

## **Project 2**

The second project focuses on mathematical models of physical systems. Student teams are tasked with creating a green energy storage system using hydroelectric power to fill and empty a reservoir and provide power on demand. Students research hydroelectric facilities and explore features of real-world design. Learning builds on physics and design principles used in Project 1 and adds Python programming concepts. Students are asked to produce a written report but also develop critical oral communication skills with a presentation.



## **Project 3**

The final project in the fall is likely the biggest challenge students will have faced in their educational journey. Teams are tasked with building and analyzing the performance of a Mars rover system that is able to navigate various obstacles and terrain. Students use Python coding and robotics to design, iterate, and test their rover over the course of several weeks in the fall semester. The project aims to build even further on programming and physics concepts learned in class but also adds the most complex design process of the semester. Professional communication is again demonstrated through the development of a technical report and oral presentation.

**TRANSFORMATIVE****EDUCATIONAL EXPERIENCES**

# **ENGR 16200 PROJECTS**

## **Project 1**

In the first engineering design challenge of the spring, students work in teams to build an egg-drop protection system that is subject to multiple design considerations. The system is then evaluated based on physics concepts learned in the first semester as well as cost-efficiency of the design. The students reengage with physics principles learned in the prior semester as well as begin connecting with their new teams for the semester.



## **Project 2**

The second project focuses on the design of a device to reduce air pollution in urban environments. Teams are tasked with creating a mathematical model using physics concepts introduced in the spring and using MATLAB to build the model. The project continues to solidify learning objectives around computer programming, advanced physics principles, and the design process, and includes written and oral reports.

## **Project 3**

The capstone of the two-semester sequence is a disaster recovery robot that autonomously navigates difficult terrain in the wake of a natural disaster. This project requires teams to use new techniques such as feedback control to develop a more advanced robot in order to navigate and map a path through an unknown environment, avoid hazards, and drop off supplies to stranded survivors. The project requires students to complete both written and oral reports, finalizing the two-semester sequence of material in programming, physics, design, and technical communication.

# STUDENT SPOTLIGHTS



**Regina Emeli**

Regina Emeli, a senior in industrial engineering, has charted an unconventional path through her four years at Purdue. As part of the Goss Scholars Do More in 4 program, Regina has explored career opportunities, and engaged with student organizations. She is looking forward to traveling to Sweden, Denmark and Finland with a Study Abroad program this May. And she has completed all of this in 4 years.

Thanks to a Do More in 4 Scholarship through the Goss Scholars Program, Regina will be traveling abroad with the Biomedical Modeling for Global Health in Scandinavia program this spring.



**Kyle Heaton**

Kyle Heaton is a sophomore studying biomedical engineering with a minor in mathematics.

Kyle's goal for his time at Purdue is to get involved in as many extracurriculars and student organizations as he can. He is an active part of Engineering Honors Ambassadors and Peer Mentoring program, the president of Relay for Life ACS, an Honors College Undergraduate Student recruiter, a Boiler Gold Rush Team Supervisor and a member of the Biomedical Engineering Society.

After he graduates, Kyle plans to attend medical school.

# STUDENT SPOTLIGHTS



**Annelise Nauman**

Annelise Nauman is a junior studying Biological Engineering with concentrations in cellular and biomolecular engineering and a minor in biotechnology and global engineering studies.

Annelise is involved in various extracurriculars and student organizations such as Engineering Honors Ambassadors, Peer Mentors, and she is the vice president of growth for GEARE ambassadors and a member of Women in Engineering.

Annelise has a passion to help people and wants to use her knowledge and skills from biological engineering to design products and treatments for others. Her previous internship allowed her to work closely with the development of vaccines and she hopes to continue this work in her future.



**Essey Adnew**

Essey Adnew is a sophomore studying Aeronautical and Astronautical Engineering. One of Essey's goals when coming to Purdue was to participate in a Co-op program and had the opportunity to complete his first session of the program through ATA Engineering working on structural analysis of aircraft and rocket engine models during his fall 2022 semester and will be returning for his second session in summer of 2023. Essey has also had the opportunity to study abroad in Greece and, through the VIP program, participate in a project for the Airforce Research Laboratory building a drone that could be used for search and rescue. He plans to specialize in either aerodynamics or structures for his future career, and possibly pursue graduate school after receiving his undergraduate degree.





# PROJECT HIGHLIGHT

The College of Engineering Honors & Goss Scholars engineering design course sequence of ENGR 16100 and 16200 is a transformative experience. Students are paired in teams of 4 at the beginning of each semester, based on individual skills and experiences in topics such as computer aided design (CAD), computer programming, robotics, physics, and communication. Working collaboratively, teams apply theoretical and conceptual materials they learn in class to complete 3 major projects through the course of each semester. Teams work through design challenges and relatively straightforward projects to begin the team development process.

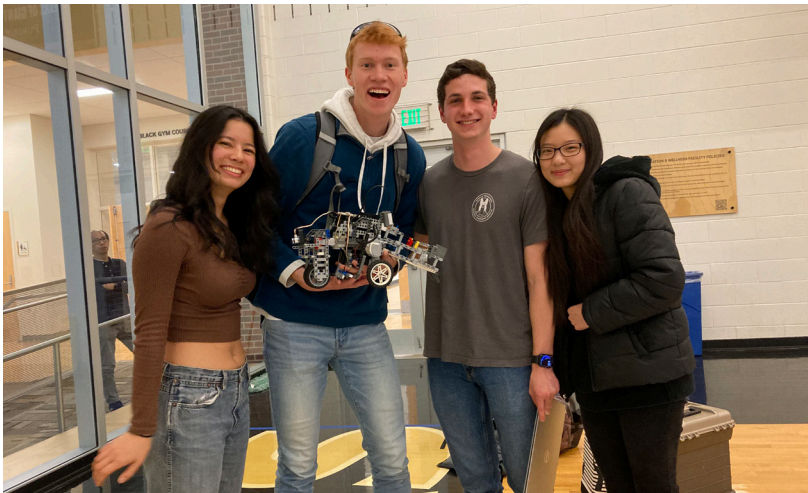
While collaborating on these initial challenges, Ryan Jordan, Simone Moulton, Dagan Knight and Jennifer Yang, who named their team the “No-Breakfast Club” due to the early 7:30 am start to their class, learned about teamwork simultaneously with theoretical and technical content in engineering design, and the team members found that they thoroughly enjoyed working together. They shared that they all felt that every team member contributed, and they grew closer as the semester progressed and developed a deepening friendship and partnership that they each value. While most groups find the experience of working with a team enjoyable, and many lasting friendships begin in ENGR 16100 and 16200, the No-Breakfast Club agreed early on to meet in person rather than virtually to make their connection more meaningful.

“Other groups would meet online and use a collaborative document for their projects, but we always met in person.” says Simone when asked about how their team dynamic unfolded.

In the first semester, the largest project, which is assigned in the first month of classes, was to build and analyze the performance of a Mars rover system that navigates various obstacles and terrain. For the No-Breakfast Club, the project first seemed insurmountable. However, as their team developed, they realized that collectively they could complete each task using the talents they each brought to the group. Ryan, transitioning now into computer engineering, had previous coding experience in Python. Jennifer, who plans on transitioning into mechanical engineering, was in robotics club in high school and had extensive knowledge in this and code analysis. Simone, who is planning to pursue aeronautical and astronautical engineering, found interest in testing, and would test the various ideas and models. Dagan, who plans to pursue chemical engineering, was excited to explore design as he was the first to propose one of the most unique features of their project, using three wheels instead of four.

The group faced challenges like issues with the line finder the night before they had an assessment, unequal weight distribution causing the rover to do wheelies and an unstable turning system which lead to the tricycle driving method improvement they used in their final prototype.

By the end of the semester, their rover could complete all the functions necessary in the outline project guide they received back in September. They coded a "dance mode" after the conclusion of their project to celebrate a successful project demo. The heartbreaking part of their success is that all groups are required to take apart their robots at the end of the semester because the parts are reused. The group agreed that this was the hardest part as they spent so much time with their rover, and it was hard to see it go. Not only the rover, but the group itself found the end of the semester bitter-sweet as developed such a strong friendship through the experience in ENGR 161.





## NEW INSTRUCTIONAL SPACE

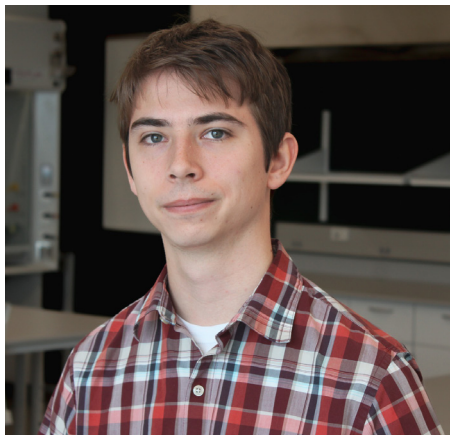
The College of Engineering Honors Program utilizes multiple different state-of-the-art instructional spaces across campus to create convenient, engaging, and inclusive learning environments for all our students and programs. These range from brand new laboratories geared towards specialized upper division courses and diverse topics to instructional spaces in which we teach many of our first-year courses as well as serve various academic support and purposes for our courses and events every semester.

Our newest classroom, located in the new Gateway building, boasts multiple features targeted at creating an engaging classroom environment. The classroom comfortably accommodates 76 students, making it a perfect space for design courses. It features six large projection screens and group work tables that are engineered for both viewing class materials and for working in teams. Additionally, it has a beautiful view overlooking the historic Purdue clock tower.

Our larger classroom, located in the Shreve Residence Hall, also has multiple aspects that enhance learning, and serves many purposes. The classroom seats up to 84 students and shares many of the amenities as the Gateway space. What sets the Shreve classroom apart is its increased floor space allowing many of our hands-on demonstrations and projects to run throughout the week. Additionally, this classroom is centrally located near the residence halls to host office hours and many after-hours events for our students near where they live.

Another of our new spaces is the wet lab located in Lambertus Hall. The wet lab space contains state-of-the-art benchtop equipment that will see increased use in future semesters as our program expands to include additional academic opportunities for our Honors Program students.

# ACCOMPLISHED ALUMNI



## Nathaniel Martin

Nathaniel Martin graduated with a degree in civil engineering with a concentration in structural engineering in December of 2022. While following the path of the four plus one program, Nathaniel completed his undergraduate degree in three and a half years and is continuing his educational journey at Purdue in a structural engineering master's program hoping to finish with his graduate degree by May of 2024.

Through his continued journey at Purdue, Nathaniel has continued to stay involved with the College of Engineering Honors Program by participating as a peer mentor every semester after first year engineering and continues to be a mentor even in graduate school. He enjoys getting to meet the new budding honors engineering students each year and help them decide on their path to their engineering discipline after the first-year engineering program.

Nathaniel had a positive and informative experience through the program and often tells prospective students, "Is engineering honors hard? Yes. Will you have late nights? Yes. Will you experience failure? Yes, but you learn so much from the experience."





# STEP RETURNS

The residential Seminar for Top Engineering Prospects experience will return to campus in July 2023 after a 3 year hiatus due to the Covid-19 pandemic. The STEP program allows prospective students the opportunity to explore the world of engineering through the lens of the College of Engineering Honors Program at Purdue University. Participant applications for the 3 week-long sessions are open now and space is filling quickly.

During their week on campus with the STEP program, students engage in collaborative classroom and project experiences that apply theoretical concepts to real world problems. Participants explore engineering as a multifaceted and collaborative discipline, develop skills, and to use those skills to create and innovate. Teamwork is an essential component of engineering, and STEP students work on a team of 4 throughout the week as they explore and solve challenging problems. Creativity, communication, design, and analytical modeling will be introduced by Purdue faculty, Purdue College of Engineering Honors student interns and guest lecturers. Each team's skills will be put to test with competitive design challenges.

The STEP experience features opportunities for students to explore engineering majors and local industry partners to see engineering professions in action. As a taste of being a Purdue University engineering student, STEP participants also participate in Purdue Traditions, such as fountain runs, trips to the book stores for Purdue gear, and informal tours. We also enjoy a movie night on Slayter Hill, a campus scavenger hunt, and Cosmic Bowling.

STEP is a full and exciting week that stretches students academically, developmentally and interpersonally, and offers a unique opportunity to test drive the Purdue University engineering experience.

# BY THE NUMBERS

4220

GOSS SCHOLARS SINCE 2010

69

GRADS W/ 2+ MAJORS

1162

GRADS W/ 1+ MINORS

162

COMPLETED CO-OP CERTIFICATE

457

GRADUATED WITH DISTINCTION +

**THANK  
YOU**

<https://engineering.purdue.edu/Honors>

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