

Central
College
— 1853 —

ENGINEERING

AT CENTRAL COLLEGE

CENTRAL IS WHERE
UNDERGRADUATES BECOME ENGINEERS

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DEGREES OF ENGINEERING

BY CINDY DEPPE

CENTRAL'S FIRST ENGINEERING GRADUATES WERE AMONG THE MORE THAN 320 NEW ACCOUNTANTS, TEACHERS, CHEMISTS, SOCIAL WORKERS AND TRAINERS WHO GRADUATED FROM CENTRAL COLLEGE MAY 19. THE ENGINEERING GRADUATES ARE THE FIRST FROM THE COLLEGE'S NEW MAJOR PROGRAM LAUNCHED IN 2015.

For many years, Central students interested in engineering first earned degrees in physics or mathematics before continuing to graduate school to complete master's degrees in engineering. By offering the engineering major at the undergraduate level, Central allows students to complete and compete in four years, instead of five in the traditional 3-2 engineering programs.

Central's four-year engineering program addresses the recruitment and retention interests of students and families and the bigger-picture issue of supporting the need for graduates in science, technology, engineering and mathematics (STEM).

"We knew when committing to the program that there were increasing levels of student interest in engineering. What Central adds is that we are small and the right fit for someone who wants to attend college at a place with more interaction with faculty as a capstone to their academic career," says President Mark Putnam, who also serves on the Iowa Governor's STEM Advisory Council Executive Committee.

"The students we've brought in are adding to the campus community because they are talented and want to be in a place like Central College. They do not want to be denied an experience of exploration and discovery," he adds.

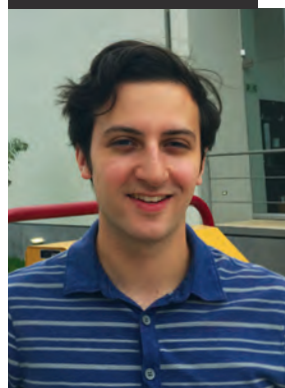
CORY McCLEARY '18



JACOB CHALLEN '18



CHRISTIAN DANIEL '19



Cory McCleary '18, Jacob Challen '18 and Christian Daniel '19 are the first students in Central's engineering program.

McCleary came to Central from Linwood, Kansas, believing he would participate in a traditional 3-2 engineering program, which allows students to attend a liberal arts college for three years and obtain a bachelor's degree in a major like physics. After the third year, participants in a 3-2 program transfer to a partner engineering school for an additional two years to earn a bachelor's degree in engineering. With Central's new major, McCleary was able to fulfill his dream of an engineering degree without transferring. In June, he will begin work in Kansas City in mechanical design for Kiewit, an international construction and engineering company.

Challen was interested in engineering but not the five-year commitment, so the original physics major switched immediately to engineering, saving him a full year of tuition yet allowing him to participate in athletics and other campus activities.

Daniel transferred to Central from the University of Oklahoma, a large public institution where he would have had a five-year curriculum. Since arriving at Central as a second-year student, Daniel has completed an internship at Vermeer in Pella and is currently studying in Mexico where he is an intern for Vermeer Equipment de México.

These student examples—and many more that will emerge as the program grows—speak to the college's long-standing success in related programs such as physics and mathematics. In fact, all physics faculty, graduates themselves of renowned domestic and international institutions, also teach in the engineering program.

ENGINEERING IN THE LIBERAL ARTS

With emphasis on mechanical and electrical engineering, the engineering program includes coursework in electronics, thermodynamics, materials and dynamic systems and physics and mathematics. The program culminates with a two-semester Capstone Design course.

Classrooms and laboratories in Vermeer Science Center plus a new design studio and electrical and mechanical engineering labs in Peace Hall, are equipped to support both coursework and independent studies.

"Our students have direct access to teaching equipment as undergraduates," says Viktor Martisovits, associate professor of physics. "Our equipment is designed for teaching, not research. Whatever we have or will get, other engineering schools have, too."

"There is significant, intentional overlap between physics and engineering majors. Engineering requires physics and while physics doesn't require engineering, courses can be taken as electives," he says. "Prospective students often ask questions about which route they should take. We can be flexible, especially in their first two years where the programs are pretty much the same. This allows us to keep their options open."

Central's engineering program "is a mix of mechanical and electrical engineering. The final year brings together what may be called control engineering," Martisovits says. "The program coursework can be supplemental for those who want to expand into graduate programs in other engineering areas."

Being grounded in the liberal arts also makes the engineering program stronger.

"STUDENTS GAIN SKILLS IN CRITICAL THINKING, WRITING AND PUBLIC SPEAKING, WHICH ARE IMPORTANT, TRANSFERABLE SKILLS IN ENGINEERING TODAY." – VIKTOR MARTISOVITS

Puneet Vishwakarma, lecturer in physics, previously taught in a pre-engineering program in Florida. He concurs with Martisovits.

"Central's program is as rigorous as any other. The capstone design course is comparable in intensity to engineering universities. The internship opportunities are accessible and provide excellent hands-on experience," Vishwakarma says.



Christian Daniel '19 takes a break on the fender of a Vermeer wood chipper during his Mexico internship.

PRACTICAL PARTNERS: REAL WORLD PROJECTS FOR REAL-WORLD EXPERIENCE

Central strongly encourages engineering students to complete internships and/or co-ops at local, national and international locations. In fact, corporate partnerships have contributed to the program's rapid growth.

When the engineering program was announced just three years ago, three local, global corporations—Pella Corporation, Precision Pulley & Idler (PPI) and Vermeer Corporation—stepped up to support future engineers by offering real-world projects and internships, supporting teaching, sharing equipment and providing funding.

"The corporate community has been enthusiastic," Putnam says. "Corporate partners tell us, 'We know what comes out of Central. Central graduates think critically, communicate well and know how to be part of a team.' At Central, you are not only with other engineering students all the time. You might be playing a sport or serving on student government. These opportunities help create something much bigger. That is the outcome a place like Vermeer is looking for—engineers who are technically competent but also have the full measure of a liberal arts education."

By partnering with local engineering companies, Central students can work on real-world engineering examples, not just classroom models.



Associate Professor of Physics Viktor Martisovits says Central offers engineering students hands-on experience.

Leon Durivage, senior engineering manager at Vermeer, volunteered to supervise this year's senior capstone project based on his previous experience working with University of Minnesota engineering students. He proposed three project options for McCleary and Challen to choose from.

"I play two major roles in working with students—one, to act as the customer for the product by helping the students define and refine the product requirements, and two, as an engineering manager, advising them on design and helping them to make connections with other engineers and technologies," Durivage says.

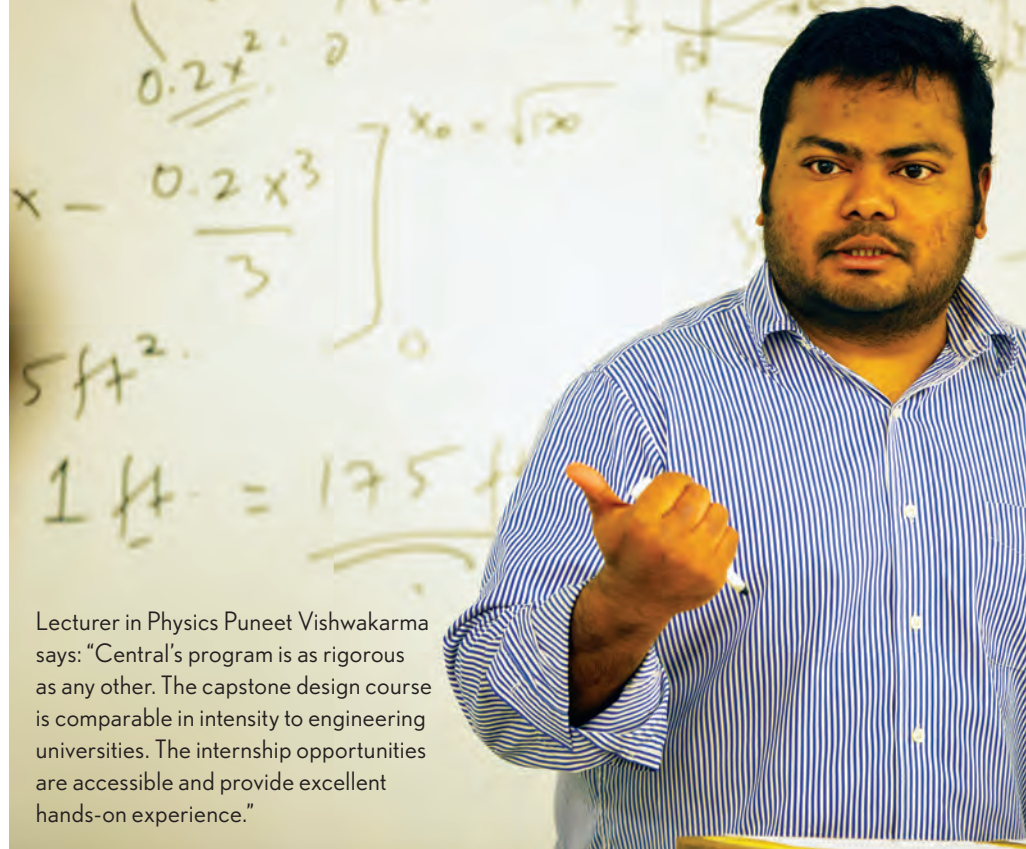
"My goal is for them to understand the realities of making tradeoffs in business, such as trading off time, features and cost, and for them to apply their engineering skills developing a product based on requirements like they would in business," he says.

Durivage and Vishwakarma meet with students weekly to monitor plans and progress.

"This was part of Vermeer's initial commitment to the partnership, to have on-site engineer instruction. This is how engineering works in the real world. All good engineering programs have similar models of bringing an engineer on site," Martisovits says.

"THE ROI FOR VERMEER IS IN EARLY INFLUENCE AND ACCESS TO TOP ENGINEERING TALENT POSITIVE ABOUT THE PELLA COMMUNITY. WE ALSO SEE A BENEFIT IN THE DEVELOPMENT OF OUR ENGINEERING LEADERS/ADVISORS IN MENTORING."

Mike Byram, vice president of product development, Vermeer Corporation



Lecturer in Physics Puneet Vishwakarma says: "Central's program is as rigorous as any other. The capstone design course is comparable in intensity to engineering universities. The internship opportunities are accessible and provide excellent hands-on experience."



Daniel's chance to see how Vermeer's equipment performed in the field was an informative experience during his internship in Mexico.

PROOF OF CONCEPT: STUDENTS

Christian Daniel '19 of Iowa City, transferred to Central from the University of Oklahoma before the second semester of his second year. Since then, he's become involved in A Cappella Choir, Ultimate Frisbee Club, Central Students for Life, ALIVE Catholic Ministries and Drone Club.

He's also completed a semester-long paid internship at Vermeer in Pella where he worked on research projects for administration and operations, developing metrics "on how to better design-efficient ways for workers to accomplish daily tasks," he says.

Study-abroad opportunities were also among the Central attractions for Daniel. He chose to study in Yucatán, where he's now involved as an intern for Vermeer Mexico.

"The Vermeer Mexico location is not a plant but a distributorship, so all of our work is after the manufacturing process, focusing on renting, selling, customer service,



Daniel, center, with his Vermeer Mexico internship hosts.

CHRISTIAN DANIEL

maintenance and repairs," Daniel says. "I have been going on trips throughout the state of Yucatán visiting clients of Vermeer for rentals and repairs and learning about

why Vermeer products are needed. I am always working with another employee because otherwise the language barrier would make it difficult to communicate."

Cory McCleary '18 came to Central to major in physics, with plans to return home to Kansas University to complete his final two years in engineering. He wanted to play football and wrestle so the smaller college had appeal. He also participated in Physics Club and helped start the Engineering Club.

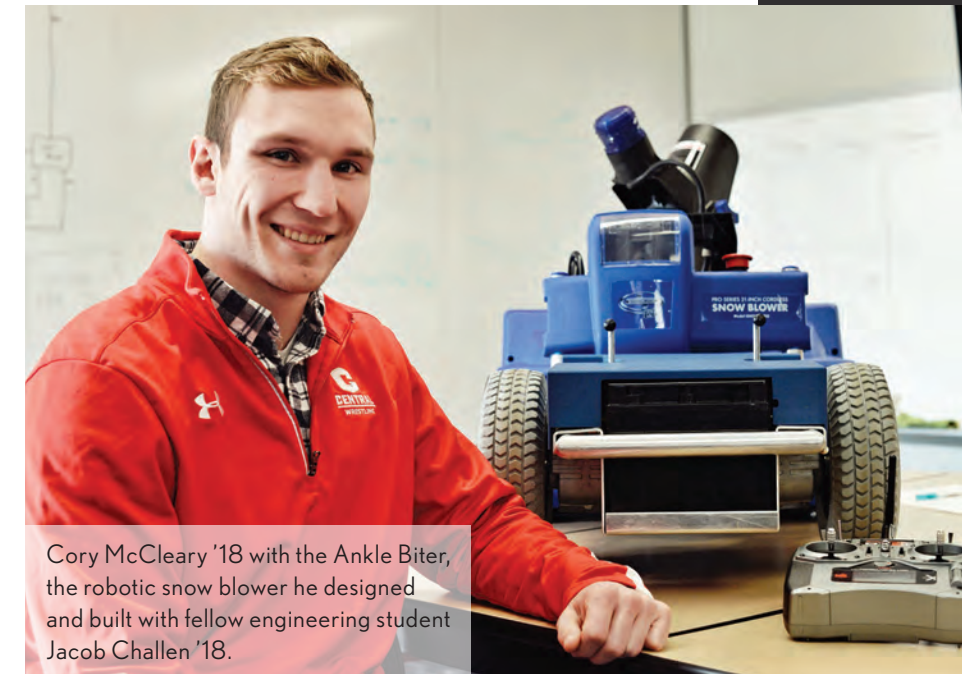
"Engineering is the most challenging thing I've ever done," he says. "Engineering is understanding every detail of every part of every process that makes anything work. It's complicated, but awesome to learn what 95 percent of people don't know."

Through his studies, McCleary has learned that engineering is not all hands-on.

"You are often handing off calculations and paperwork to a drafter or designer or technician who will do the hands-on. If you want more hands-on, then you should probably look into alternative professions," he says.

McCleary took his own advice and spent last summer as a mechanical design intern at Kiewit in Kansas City. As soon as the internship was over, Kiewit offered him a full-time position, which he will start in June.

"The biggest thing I've learned is that just because something works in your head or on



Cory McCleary '18 with the Ankle Biter, the robotic snow blower he designed and built with fellow engineering student Jacob Challen '18.

CORY McCLEARY

paper doesn't mean it works in real life. I've learned from mistakes. Failure is the best way to know you're making progress. I have learned that there is always a solution, it just may take a handful of tries to find it. My new job is the perfect fit for me. I may pursue a graduate degree later but right

now, I want a break from school," he says.

McCleary teamed up with fellow engineering student Jacob Challen '18 for their capstone project to build a remote-controlled snow blower under the supervision of Durivage and Vishwakarma.



Jacob Challen '18 says designing and building the robotic snow blower was "one of the high points of my college career."

Jacob Challen '18 from Jefferson, Iowa, knew Central had a well-respected physics program with small classes. He assumed he would transfer to Iowa State University's 3-2 engineering program.

"Engineering was my main goal, but I decided five years was too much. I could save money by doing the Central program in four years. Engineering here is high-level, demanding and technical. The professors will challenge you in areas

where you maybe aren't the strongest but they want you to learn and succeed. I have definitely felt the benefit of getting personal, one-on-one time with professors," Challen says.

The strength of Central's engineering program was confirmed for Challen last summer when he tutored Iowa State engineering students while taking summer classes. He tutored student-athletes who needed to catch up after being overloaded

during their sports season. That's a challenge Challen could appreciate since he participated in wrestling his first two years but chose to focus on academics once he switched his major.

"It was cool to have another view of what we're taught and how it's covered. I was surprised that we were all getting the same level of education. It was confirmation that I made the right decision to be at Central with small classes," he says.

His tutoring experience may also influence his future.

"I've been told I'd be a good teacher but I'm not sure yet if I will pursue that with grad school. I'm taking a gap year to get work experience in electrical engineering, which is what I want to do. Having the combination of mechanical and electrical here makes us more versatile. We don't have to specialize. With the future in industry having more robotics, Central's combination is the best for getting hired," Challen says.

Challen, like McCleary, says the capstone design course "has been one of the high points of my college career—getting to apply all you've learned, dive in deeper to what you are learning, literally building on your knowledge is one of the coolest things."

CAPPING THE CAPSTONE

The senior-level capstone design project is a two-semester course intended to mimic what it's like to find an engineering solution to a real-world problem.

Vermeer engineer Leon Durivage presented McCleary and Challen with three project options:

- A hand crank bike that emphasized mechanical engineering (McCleary's choice because of his background and hands-on interest).
- A sun tracking system for a solar panel that emphasized electrical engineering (Challen's choice because of his interest in electronics).
- A remote-controlled snow blower that emphasized both mechanical and electrical engineering principles.

The pair compromised and chose the snow blower project. Each had the opportunity to work in his area of interest. With weekly guidance from Durivage and Vishwakarma, the students worked together to build the Ankle Biter, their nickname for the remote-controlled snow blower.

"The capstone project was building a prototype for proof of concept," McCleary says. "We altered purchased products and modified the robotics."

The students first purchased a manual snow blower and began to add parts—some recycled, some purchased and some from a motorized wheelchair. The resulting Ankle Biter is run by two 12-volt batteries and a microcontroller that "talks" to the machine.

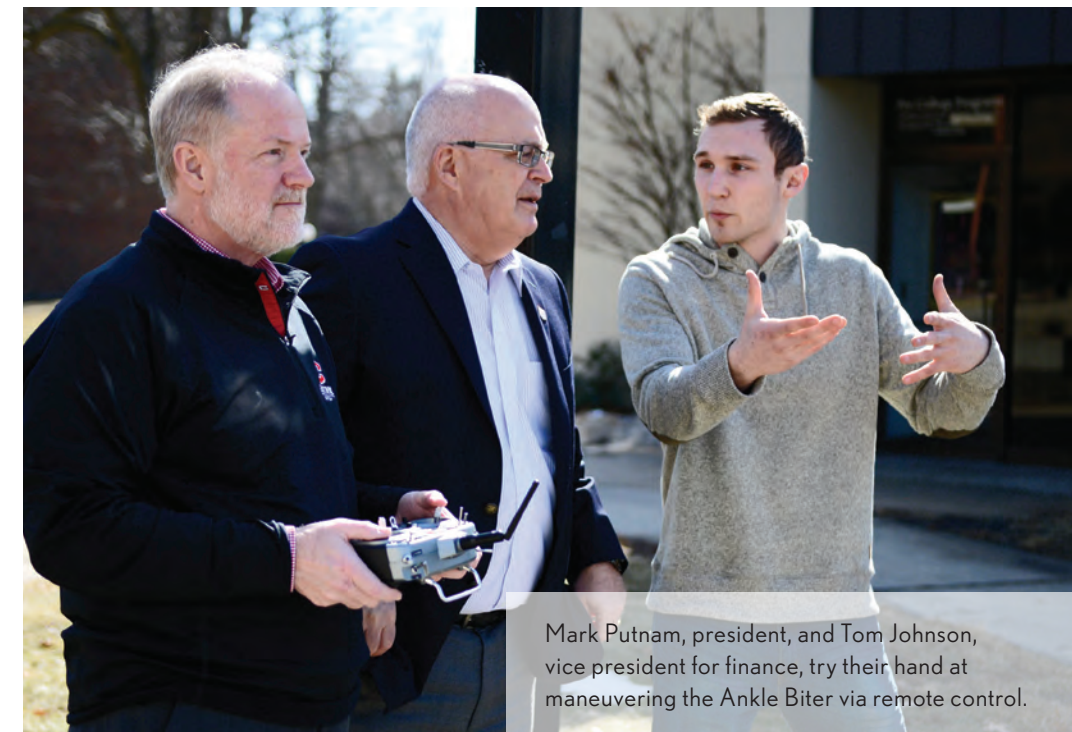
"It should run for 60 minutes at two miles per hour and will easily clear a 50-foot by 10-foot driveway with one charge," McCleary explains. "Based on what we have in it, it would retail for \$700-800," not accounting for their labor costs.

McCleary and Challen determined the product development schedule and met weekly with Durivage and Vishwakarma who offered guidance on technical issues, assessed design progress and monitored performance. Vermeer also offered equipment use as part of the partnership.

"The design is all done on campus in the design studio in Peace Hall,"



Challen and McCleary carry the Ankle Biter outside before demonstrating it to Central's senior leadership team.



Mark Putnam, president, and Tom Johnson, vice president for finance, try their hand at maneuvering the Ankle Biter via remote control.

Vishwakarma says. "The intellectual build is here on campus but sometimes the physical build may be at industry or other locations."

"Ultimately, we want to hire graduates of this program. The capstone project makes them hireable. Our goal as a company is to

hire top talent, so it's good for us to share our knowledge too," Durivage says.

The joint project also had another outcome: The two friends enjoyed working together to solve a real-world problem.

"We're pretty proud of it," Challen says.

"CENTRAL COLLEGE HAS BUILT A REPUTATION FOR ATTRACTING AND PRODUCING SKILLED, MOTIVATED AND WELL-ROUNDED STUDENTS. THE CURRICULUM MATCHES MANY OF THE NEEDS PPI HAS FOR ENGINEERING SKILLS USED IN THE COMPANY. IN ADDITION, THE FLEXIBILITY TO USE LAB EQUIPMENT AND MACHINE TIME IS APPRECIATED. WE ARE EXCITED ABOUT THE OPPORTUNITY TO CONSIDER CENTRAL COLLEGE STUDENTS FOR INTERNSHIP AND EMPLOYMENT OPPORTUNITIES IN THE FUTURE."

- Tim Wolf, vice president of engineering, Precision Pulley & Idler (PPI)



“ENGINEERING HERE IS HIGH LEVEL, DEMANDING AND TECHNICAL. THE PROFESSORS WILL CHALLENGE YOU IN AREAS WHERE YOU MAYBE AREN'T THE STRONGEST BUT THEY WANT YOU TO LEARN AND SUCCEED. I HAVE DEFINITELY FELT THE BENEFIT OF GETTING PERSONAL, ONE-ON-ONE TIME WITH PROFESSORS.”

– Jacob Challen '18
Major: Engineering
Minor: Physics
Jefferson, Iowa



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ADMISSION@CENTRAL.EDU
WWW.CENTRAL.EDU/ADMISSION

812 UNIVERSITY ST., PELLA, IOWA 50219
641.628.7616

