REACHING THE ‘PINNACLE OF EXCELLENCE’ AT SCALE

Residential learning sits at the core of many higher learning institutions. Complementary to that, peer institutions, such as Stanford, MIT, Georgia Tech and Arizona State have experimented with opportunities for students seeking high-quality online learning opportunities and credentials. It is partially driven by the accelerating growth of online student population in higher education. While the overall number of post-secondary students in the United States remained at about 20 million, the share of those taking at least one online course increased by 25% from 2012 to 2016. Based on lessons learned by these peer institutions and on our unique land-grant mission, we are poised to innovate online learning by focusing on excellence, quality and effectiveness.

The “pinnacle of excellence at scale” is an aspiration for what we do in online learning in engineering.

The overall strategic direction of Purdue Online, across the entire Purdue system of multiple campuses, has many pieces, one of which is the focus on post-graduate learning and credentials by the College of Engineering. This short article tries to crystallize some of the ongoing conversations as we continue to seek input from our faculty, students (on campus and online), staff, alumni and partners.

There is no shortage of challenges. How can we keep supporting our graduates’ professional growth after they leave Purdue’s red-brick campus? Which online learning innovations should we pursue further? What additional modalities should Purdue Engineering offer to our students? How can we ensure that distance-learning and online courses are of high quality and effective? How do we employ asynchronous education technology to enrich on-campus learning, and what would that mean for our residential education model? Such questions only scratch the surface of the online innovation field. Moreover, confusion exists about the very term and vocabulary of online education.

Fundamentally, teaching does not automatically imply learning, and this gap is particularly wide online. We often try to compensate for these uncertainties by overemphasizing technology at the expense of pedagogical efficacy. Experiential acquisition of knowledge is particularly challenging in an online environment.

In the face of these challenges, as part of a public university system, we have a special responsibility to generate and disseminate knowledge. The public has invested in Purdue so that we have the faculties to create the best programs for the state, the country and the global community. We believe in employing our resources to empower individuals to achieve their full potential. The College of Engineering in particular has been providing distance-learning solutions for 60 years now, with outstanding quality programs (ranked No. 5 in US News and World Report 2019 in Online Master’s Engineering programs).

As we set to write a new chapter in online learning innovation, we start by recognizing that we do not have all the answers and have yet to create some of the necessary framework. We need to keep our receivers well-tuned, our attention focused, and communication channels clear as we pivot in this new terrain of online education.

Mung Chiang
Dimitrios Peroulis
Learn More: proed.purdue.edu/scale
Purdue Online leads a growing trend

The same programs that keep Purdue’s College of Engineering top-ranked put Purdue Online at the top of the rankings, too. In fact, U.S. News & World Report listed Purdue’s online graduate engineering program fifth among 93 schools in 2019.

Stanislaw Żak is one of the more than 85 faculty and staff responsible for that status. He brings the same innovation ethic to teaching his online courses that he applies to his research as a Purdue professor of electrical and computer engineering.

“I always try to make distance learning less distant,” Żak says. As a professor whose students have described him as “accessible outside class, inspirational and caring,” Żak says he continually asks himself how he can compensate for the lack of a physical presence, and how to create a “classroom experience” when teaching online. “The technology has a very important part to play. Software that allows the online students to introduce themselves online makes a difference,” he says.

As a co-author of a book on optimization, Żak teaches Optimization Methods for Systems and Control, as well as three other courses. He says he appreciates the added thoughtfulness of online students’ comments and questions: “I teach the same course with exactly the same requirements both online and face to face. The class discussion in the online course can often be lengthier, even more insightful. When you’re face-to-face, you can say things without too much thinking. But when you have to type, you’re challenged to be clear rather than speaking impulsively.”

Żak says he understands that prospective students who haven’t tried online learning may be apprehensive about it. He supports Purdue Online’s new one-credit-course initiative as a means for students to sample online coursework without a major commitment. He adds that a willingness to sample online study typically leads to more — a trend he believes will grow.

“The move to online teaching seems inevitable,” Żak says. “When I participate in online teaching, I feel that I’m at the cutting edge of education. It’s challenging; it requires more time to plan, design, deliver and evaluate online instruction.

“It’s amazing how fast the students embrace this new technology. There are quite a few students who obtain their master’s degrees very quickly. There really is no limit to online education.”
Concurrently ranked in the top 10 by U.S. News and World Report, the online master's degree programs in engineering offer Purdue prestige with the flexibility that working professionals need. Online students learn from the same faculty who teach on-campus courses.

As a professional, you can expand the depth and breadth of your current skills in a wide variety of engineering fields. Innovative options like the popular Interdisciplinary MSE and dual MSE-MBA programs add to your options.

For the most up to date list, see us at proed.purdue.edu

Elisabeth Schwartzers’ job title is a mouthful. She is a 2.7L/3.0L Nano Valvetrain Design and Release Engineer for Ford Motor Company in Dearborn, Michigan.

“It’s a lot of words to say that I’m responsible for overseeing a set of components within a set of engines,” Schwartzers says. She oversees the valvetrain within the “Nano,” the 2.7/3.0L V6 EcoBoost gasoline engines, at every stage from conception through phase-out.

Before she finished her BS in mechanical engineering at Purdue in 2016, Schwartzers knew she wanted to get a master’s degree. But at the same time she was planning on starting graduate school, she was offered a great job with Ford, so she had a decision to make.

“That was really where I wanted to work,” she remembers. “Online courses seemed like the perfect solution, allowing me to work on my master’s while I gained technical knowledge in an industry I love and before I start a family with my fiancé.”

Schwartzers says Purdue Online was easy because she already knew the caliber of Purdue professors. “They are industry and research leaders. I could tell they cared about the students.

“‘The professors chosen to teach these courses are the same professors who teach the on-campus students,’ she says. ‘And they do not treat on-campus and off-campus students differently in terms of expectations for deliverables, deadlines and projects. They challenge and push us to discover connections between our coursework and the industry we work in or are interested in.’

Schwartzers says Purdue Online also has let her choose the classes that she’s truly interested in. “I wanted to learn more about analytical and numerical solutions to heat, mass and energy transport, as well as gas dynamics and thermodynamics. Purdue allowed me to do that from the very first class of my master’s program.”

“ ‘That has continued to be my experience with online courses. Purdue has managed to make me feel like I’m still on campus, still sitting in the lecture hall in front of my professor and about to walk into a lab.’”

Now seven courses into her master’s studies, Schwartzers says she’s learned that what she’s getting online with Purdue matches exactly what on-campus students are getting.
Purdue’s School of Engineering Education (ENE), the first of its kind, was established with a mission “to transform engineering education based on scholarship and research.” In addition to master’s and Ph.D. programs, ENE offers a 10-credit-hour graduate certificate: Teaching and Learning in Engineering. The certificate program originally was designed to prepare doctoral students so valuable in courses with students who have such varied backgrounds and experiences. Donna Riley, the Kamyar Haghighi Head and Professor of Engineering Education, says, “each online course is designed to maximize personalized instruction with extensive feedback from the instructor. In addition, the courses provide many opportunities for student-to-student interaction, which is valuable.”

Each online course is designed to maximize personalized instruction with extensive feedback from the instructor.

Donna Riley, the Kamyar Haghighi Head and Professor of Engineering Education

One Course Higher is the result of a partnership between the Purdue University Development Office and Purdue Online. The courses are in line with Purdue’s strategic plan that was adopted by the Board of Trustees in June 2018, “Our intent is for Purdue to be the leader in online higher education, whether for traditional bachelor’s degrees, tailored master’s and employee training and upskilling designed with and for corporate partners. This includes lifelong learning programs, recognizing that our alumni in fields such as engineering will want and need to upgrade their knowledge and skills regularly going forward.”

Learn More: bit.ly/OneCourseHigher
Email Us: proed@purdue.edu

Gerry McCartney, Executive Vice President of Purdue Online

One Course Higher: Free online learning for Purdue Engineering grads

As more universities create online programs, Purdue University’s College of Engineering is offering college alumni a new online learning opportunity called the One Course Higher program.

One Course Higher offers free, noncredit online courses to more than 90,000 Purdue College of Engineering alumni — for life.

“Learning does not stop when you graduate, and the educational engagement between our alumni and Purdue continues for a lifetime,” says Mung Chiang, the John A. Edwardson Dean of the College of Engineering. “Our 90,000-plus alumni can access these courses anytime, anywhere — for free, for life.”

Online learning fits into Purdue Moves, the University’s initiatives to provide transformative education, world-changing research, STEM leadership and affordability and accessibility. It’s also in line with Purdue’s mission as a land-grant university to provide opportunity for traditional and nontraditional students.

An evolving digital library of educational content is available in One Course Higher. The collection includes courses that had been offered only in tuition-based online degree programs. Currently, there are eight selections:

- Multidisciplinary Design Optimization
- Laser Scanning
- Economic Decisions in Engineering
- Lean Manufacturing
- Preclinical and Clinical Study Design
- Random Variables and Signals
- Reliability-Based Design
- Nuclear Engineering Principles

Our intent is for Purdue to be the leader in online higher education, whether for traditional bachelor’s degrees, tailored master’s and employee training and upskilling designed with and for corporate partners.

Learn More: proed.purdue.edu/ENE
Email Us: engronline@purdue.edu

Purdue Online
Purdue and Intel are joining forces to offer a new cybersecurity badge program. The program emphasizes secure design principles throughout the product-development lifecycle.

"Security is a big issue that affects everyone now and will become even more important in the future as the internet of things grows," says Rick Echevarria, Intel vice president of the Software and Services Group and general manager of the Platform Security Division. "This challenge is now beyond security. We need to design for security. Nearly every day, we hear about a new cyberattack impacting businesses and often thousands of individuals."

The software industry was the first industry to encounter significant cybersecurity threats. However, Echevarria notes that "design for security" is needed in all industries, not just software. Cyberattacks are impacting businesses and thousands of individuals every day, and a cybersecurity talent shortage is exacerbating the situation.

"One of the major trends in the additive manufacturing area is increased activity in industrialization — additive has gone from prototype to production," says Rita Burrell, executive director of Purdue Online’s division within the College of Engineering. "With this increase of utilization in manufacturing, our program will arm engineers with the ability to attain, as well as maintain, timely, relevant knowledge in industrialized additive manufacturing."

"Innovating how we learn online is a key priority for Purdue’s College of Engineering," says Mung Chiang, the John A. Edwardson Dean of the College of Engineering. "The online program in additive manufacturing is both timely in its subject coverage and creative in the industry partnership with The Barnes Group Advisors. We are excited about this important initiative by the School of Materials Engineering."

The courses will be offered in a convenient format tailored to students at the engineer/manager and executive levels. Course content will cover AM science, technology, economics and business, and will be derived from The Barnes Group Advisors’ industrial experience. AM certification students will get support from The Barnes Group’s ADDvisor Services team, whose contributions to the field include certifying flight hardware using AM for series production engines and aircraft.

The Design for Security badge program is to introduce security principles that not only protect physical infrastructure and the hardware and software that underlie it, but also to enhance the understanding of various technical constraints and processes that support operational security. These principles demonstrate the importance of deliberate security planning in all phases of product development, not only during implementation and deployment.


The four existing courses provide advanced security knowledge that professionals can immediately apply to their current roles, projects and initiatives while learning in a flexible online environment.

Purdue Online will offer Additive Manufacturing (AM) Certifications in March 2019 in partnership with an industry leader. The programs will give working professionals and students an opportunity to explore industry case studies and stay current with the rapidly industrializing technologies that build 3D objects layer by layer and in a variety of materials.

These professional and noncredit certification programs will be offered in collaboration with the Purdue School of Materials Engineering and The Barnes Group Advisors, a Pittsburgh-based consulting company. The Barnes Group, founded by Purdue graduate John E. Barnes (BSMSE ‘92, MS MSE ‘94), has extensive additive manufacturing expertise. "Purdue helped shape the engineer and the entrepreneur that I have become today," Barnes says. "I have always admired the astronauts who attended Purdue and their efforts to give back to the University. I feel this is my small way of giving back, too."

AM technologies include 3D printing, rapid prototyping, direct digital manufacturing, layered manufacturing and additive fabrication. AM is used to fabricate end-use products such as aircraft, dental restorations, medical implants, automobiles, and personal products.

Learn More: Purdue's new online badge program
Learn More: Purdue Online's Additive Manufacturing Program
Consistently near the top of the annual U.S. News & World Report rankings, Purdue Online currently stands at No. 5 in the magazine’s 2019 rankings of online graduate engineering programs.

In its report, the magazine states factors that contributed to the high ranking: “Distance students are admitted under the same criteria and processes as their on-campus counterparts. They have the same classes, homework and exams. Distance and on-campus students receive the same degrees, and there is no differentiation on their official transcripts. Quality and rigor can be expected. Creating opportunities for engagement with other students and alumni are integrated into a personalized student-centered approach.”

STUDENT-INDUSTRY CONNECTIONS

Learners hail from a remarkably broad range of industries. These statistics represent the number of different companies that employ our learners.

### DUAL-DEGREE PROGRAM

- **#1 MBA**
- **#5 MSE**
- **#6 Aeronautics & Astronautics Engineering Graduate Program**
- **#9 Electrical Engineering Graduate Program**
- **#6 Industrial Engineering Graduate Program**
- **#8 Mechanical Engineering Graduate Program**

### Best Online Programs

- **US News Online Programs**
- **US News Veterans Engineering**
- **US News Best Online Programs**

### Top 10 Graduate Engineering Program Rankings

- **Aerospace Defense**
- **Consumer Healthcare & Appliances Pharmaceuticals**
- **Computing & Telecommunications**
- **Energy**
- **Industrial Machinery & Components**
- **Agriculture & Construction**
- **Automotive**
- **Aerospace**
- **Consumer Appliances**
- **Healthcare & Pharmaceuticals**

Purdue Online
SIGNIFYING PROGRESS
Purdue, Taiwanese University team up to meet global need for engineers

How much will demand for engineers increase globally in the coming decades? Here are some factors that speak to that demand growth:

• Global need for water is projected to increase by 30 percent.
• Basic infrastructure is lacking worldwide.
• The world’s population will reach 9.7 billion by 2050 according to a United Nations projection.

Two prominent universities in engineering in the United States and Taiwan have seen the demand to form a joint online learner’s experience.

Purdue Online, College of Engineering has reached a heightened global scale with a groundbreaking agreement to forge a digital degree between Purdue University and National Cheng Kung University (NCKU), of Tainan, Taiwan. NCKU is a premier engineering-focused university in Asia.

In 2019, Purdue Engineering online course options will be open to NCKU engineering students. Every NCKU student who completes one or more of these courses will have the opportunity to apply for and, if accepted, enroll in this fast-track program between Purdue and NCKU. The first program to be rolled out is called “3+1+1,” for which NCKU students can spend three years studying at NCKU and two additional years with Purdue Online, earning a bachelor’s degree from NCKU and a master’s degree from Purdue.

“Purdue Engineering aspires to the pinnacle of excellence at scale, and teaching a large pool of premier engineering talents is one of the three strategic directions,” says Mung Chiang, Purdue’s John A. Edwardson Dean of the College of Engineering. “Through our world-class and diverse online education offerings, we are scaling up new dual-degree programs that will benefit many engineering students around the world.”

George Chiu, assistant dean for Global Engineering Programs and Partnerships at Purdue, noted the long history with NCKU, which goes back to the 1950s. A portion of an aid program in 1952 — the Purdue-Formosa Project — provided significant financial and technical support that helped propel NCKU’s growth into a major research-led comprehensive university. Prominent Purdue faculty, such as Norris Shreve and Lillian Gilbreth, led or participated through the 1950s.

“NCKU has since produced alumni whose efforts and achievements were pivotal to transform Taiwan from a once agricultural island to a technology powerhouse,” Chiu says.

The partnership is meaningful for Purdue in demonstrating progress toward its goal of becoming the world’s premier provider of online engineering education.

“The College of Engineering has been quick to see the possibilities in the online learning initiative President Mitch Daniels and the Board of Trustees have added to Purdue’s strategic plan,” says Gerry McCartney, executive vice president for Purdue Online.

“This partnership with NCKU adds a significant international component, and more importantly, the opportunity exemplified by this novel arrangement opens the door for partnerships with other institutions that wish to augment their current engineering instructional content with Purdue content.”

Purdue Online programs within the College of Engineering are designed to help students advance their technical skills while active in their careers. The courses offer resources, as well as academic and technical support, that enable students to make the most of the online learning experience. Purdue’s online master’s engineering program is ranked No. 5 by U.S. News & World Report.

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Gerry McCartney, Executive Vice President for Purdue Online, Oesterle Professor of Information Technology
Our Legacy. Your Launch.