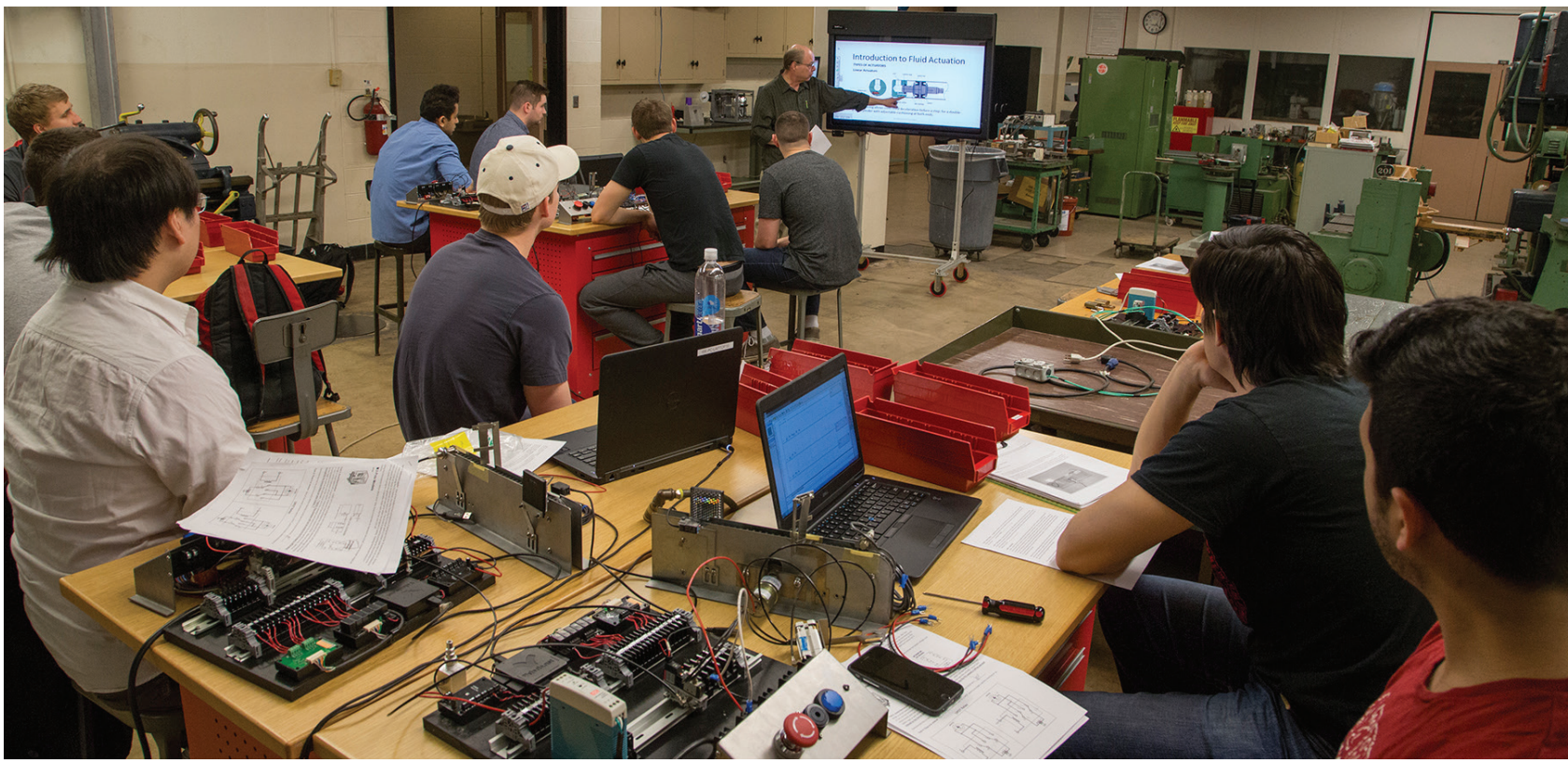
BuckISE

News from The Department of Integrated Systems Engineering at The Ohio State University

Fall 2016 ise.osu.edu



Lab Courses Bridge the Gap for Manufacturing Jobs

Stories by Nancy Richison

Photos by Cedric Sze

In recent years, ISE Department Chair Phil Smith has seen a rise in the number of students seeking employment with manufacturing companies. So, he began to look at ways in which the department could further develop its manufacturing engineering track for undergraduates, giving them hands-on background in processes and modeling techniques, while simultaneously making graduates of the program more attractive new hires to the industry.

The strategy is one that has great appeal to businesses. "Manufacturing is critical to the economy of Ohio as well as the U.S.," says Shubho Battacharya, associate chief engineer for Honda Engineering North America Inc., "and manufacturing workforce development is vital to Honda and other manufacturing companies for leading the future of manufacturing. The OSU ISE Department's laboratory courses in automation and forming, along with its focus on continued development of a comprehensive manufacturing engineering track for undergraduate students, are solid steps toward the development of a workforce that can sustain, grow and innovate industries in this sector."

The new track is intended to close the gap between textbooks and on-the-job learning. Associate Professor Jerry Brevick says the Intro to Manufacturing

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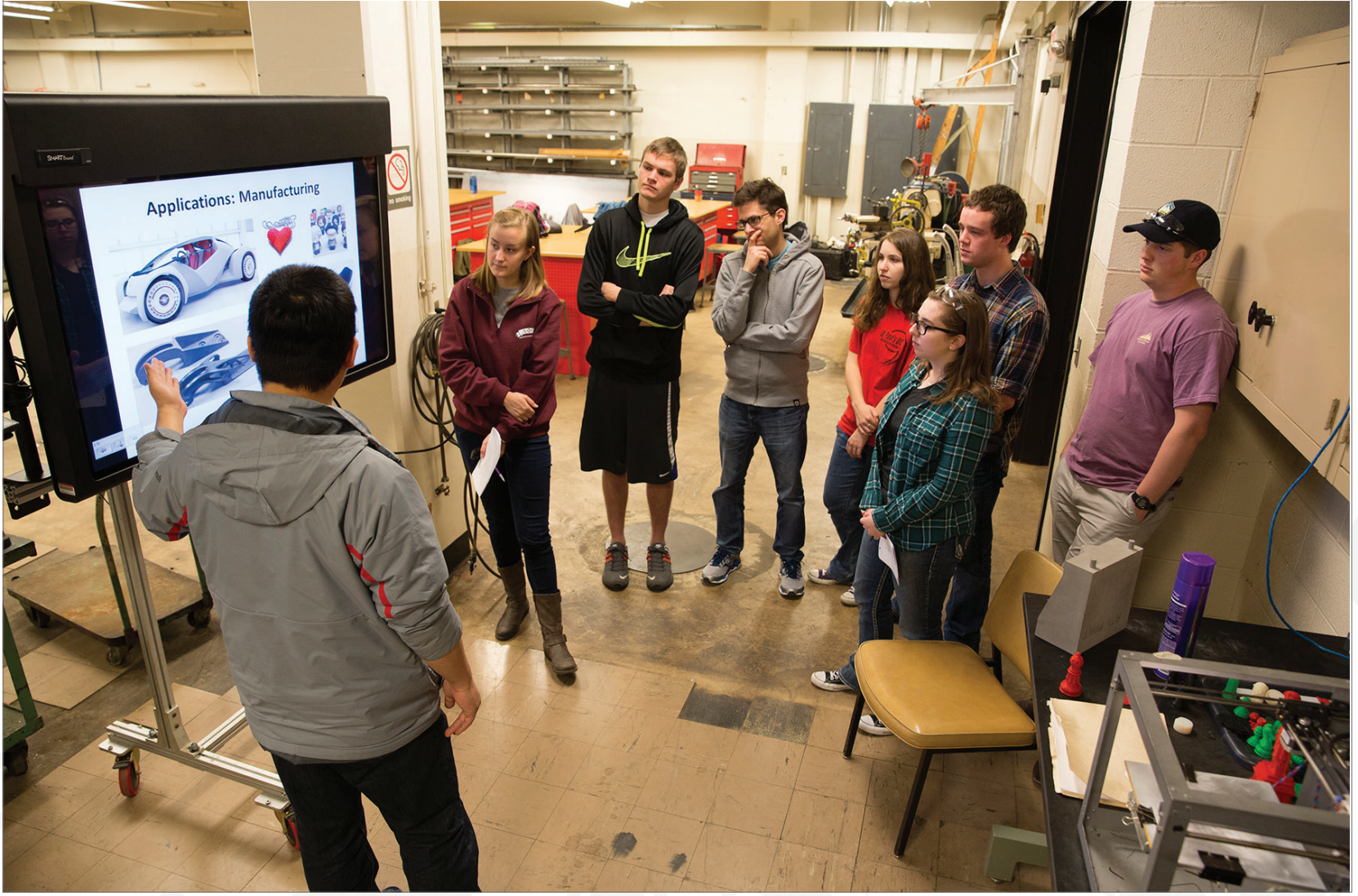

> “This places the student in a better position to create and enhance automated manufacturing processes.”
>
> Bill Tullos,
> *Research Associate Engineer*

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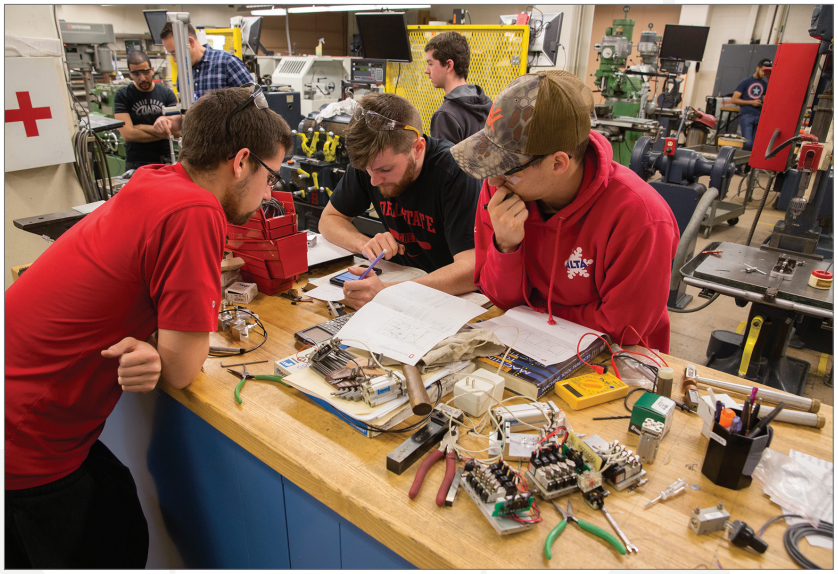
Engineering (ISE 2500) has always provided hands-on experiences with most common manufacturing processes. “As OSU was transitioning from the quarter system to semesters, feedback from the ISE Advisory Board indicated that our undergraduate ISE engineers going into manufacturing jobs lacked some fundamental knowledge and skills,” he says. “In response, the hands-on lab-based ISE 3500 manufacturing track course was developed to teach most of the topics brought to our attention by the Advisory Board.”

In ISE 3500, Brevick says, students set up tooling, and operate manual and computer numeric control (CNC) machines for machining aluminum and copper-alloy components for a machinist’s hammer. “The labs are designed for students to learn about process sequencing, measurement tools and systems, work-holding principles, the machinability of common engineering materials, and critical process parameters for machining,” he says. “In the automation course lab, students build control systems using programmable logic controllers (PLCs), sensors and actuators. The labs are designed for students to learn how to design automated systems using PLCs and pneumatics, create schematics of these systems, understand the science behind how common sensors and actuators operate, and program PLCs using ladder logic.”



Research Associate Engineer Bill Tullos says perhaps the biggest benefit for students is understanding how these industrial automation systems function, which enables them to gain additional insight into how automation processes work. “This places the student in a better position to create and enhance automated manufacturing processes,” he says.

ISE also collaborates with Edison Welding Institute (EWI), which is dedicated to developing, testing and implementing advanced manufacturing technologies for industry. “EWI has a long – 30-plus-years – history of supporting the undergraduate and graduate students of the College of Engineering at OSU, Welding Engineering, ISE and Mechanical Engineering.,” says Hyunok Kim, an ISE Lecturer and EWI Forming Center Technical Director, who has been teaching sheet-metal forming courses to ISE students for the past couple of years.

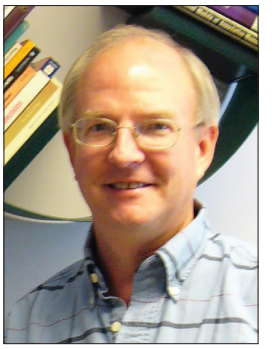
Kim says the partnership with EWI allows graduate students to obtain additional experience through their work on various projects for EWI’s commercial and government clients. “Three industry sponsors – Honda R&D, KTH Parts and Shiloh – actively participated through this project by interacting with the OSU students who participated in the project works,” he says. “Another example is ongoing collaborations with graduate students of two ISE faculty members, Professor Taylan Altan and Professor Farhang Pourboghrat on warm-forming of aluminum alloys for lightweight automotive structures that was sponsored by EWI’s commercial clients and the state of Ohio.”

Kim says during his career he has experienced a number of industry workers who have limited knowledge and experience in sheet-metal forming when they first begin their jobs. The ISE program allows students to become more competitive globally in scientific fundamentals as well as practical applications for industry. Brevick agrees, saying that, “Students exit the program with more confidence and ability to contribute immediately upon graduation.”

Serving Students and Society

Phil Smith
Department Chair

As with any organization, one of our major challenges for the ISE Department is the need to continually adapt in order to better prepare our students. This requires us to regularly review our curriculum, adding new courses as well as introducing new content into existing courses.



Our strategy has been two-fold. First, in their initial two years, the primary goal is to ensure that our students are highly capable engineers. In the following two to three years (many of our students take five years to graduate), we have four additional goals:

- To provide them with a strong foundation in industrial engineering, ensuring that they are strong technically.
- To help them develop their communication, social, organizational, leadership and management skills to prepare them for the broader roles they will play as they progress in their careers.
- To ensure that they get relevant practical experience (through internships and capstone projects; and from participation in leadership roles in student organizations).
- To give them an opportunity to explore some areas in greater depth (described below), developing additional technical skills and increasing their preparation for different career paths.

Finally, and not to be underestimated, we have worked very hard to produce a program where our students, faculty and staff feel like a family.

As described in more detail elsewhere in this and some of our other recent newsletters, depth is incorporated in our undergraduate curriculum by requiring all students to complete one of the following tracks which mirror the strengths of our graduate program:

- Data analytics and data-driven optimization
- Human systems integration
- Management systems and operations research
- Manufacturing engineering
- Supply chain management

Our students who complete the manufacturing track, for instance, have an opportunity to take hands-on manufacturing lab courses focusing on automation, forming and machining (with others to be added soon), as well as take a course that presents them with a larger systems perspective on design, considering the need to simultaneously consider multiple objectives such as manufacturability, quality and sustainability.

As a second example, students who take the data analytics track take all of the core courses that make them effective industrial engineers, but also take five additional courses in computer science, including database design and data mining. This produces a unique set of graduates with skills that you would not find in undergraduate industrial engineering students from any other program in the country.

And if all this wasn't enough, many of our students elect to take the three-course ISE sequence in Integrated Lean Six Sigma (easily argued to be the best in the country) and minors in business, entrepreneurship, design or even in other languages such as Spanish.

In short, our program at Ohio State tries to set up our students with careers that live up to the conclusions of a University of Chicago study which placed the occupation of an "industrial engineer" in the top 10 of America's happiest people in terms of job satisfaction (and that's not just engineering, but all kinds of jobs). If you'd like to see some of our students in action and learn more about the curriculum, you can go to: ise.osu.edu/home/recent-photos/

World-Class Faculty Produces World-Class Students

Chuck Elgin, BS, ISE '78
Chair, ISE Alumni Advisory Board '

It has been my honor to serve on the ISE Alumni Advisory Board for most of my adult life. As a member of the Advisory Board, our role is to provide input and guidance to the Department chair on current challenges, tactics and long-term strategies to address departmental needs. I've had the opportunity to provide input and watch the ISE Department evolve to meet the ever-changing and demanding needs of society.

Recent innovations within the ISE Department include the newly renovated Spine Research Institute under the leadership of Dr. William Marras, the addition of Six Sigma to the curriculum under the leadership of Dr. Scott Sink, and new curriculum tracks for Data Analytics and Supply Chain Management and Logistics. Your ISE Department continues to innovate in creating courses and career tracks that businesses need and want while giving students an incredible education at the same time.

As Woody Hayes once said, "You Win with People!" During my visits to OSU, I've had a chance to meet many of the ISE faculty members and listen to their presentations regarding their leading edge research. A recent example was a presentation by Dr. Farhang Pourboghrat on the use of mathematics/modeling to create lightweight and strong structures using composites, nano-composites and polymers. Leveraging Dr. Pourboghrat's research, companies will be able to test alternative structures using models instead of going through the time and expense of building the structures and then testing them.

The ISE Department is looking for industry partners and individuals who are willing to sponsor an ISE project, offer internships to students, or who are willing to share their expertise with students in a classroom setting or in an advisory-panel role. If you are interested in learning more about sharing your time, talent and/or treasure with the ISE Department, please contact Dr. Phil Smith at (614) 292-4120, or smith.131@osu.edu.

Won't you join us in supporting this great department – our department – Integrated Systems Engineering at The Ohio State University!

Go BuckISE!

What does Ohio State mean to you?

I would like to give $_____to the Department of Integrated Systems Engineering

☐ Use my gift where it is needed most.

☐ I would like to designate my gift to be used for: _____

☐ My employer will match my gift. I have enclosed my employer's matching gift form.

Name: _____ Degree/Year: _____

Address:_____ City: _____ State: _____ Zip:_____

Daytime phone: _____ Evening phone: _____ E-mail address:_____

Employer: _____ Title: _____

I have enclosed a check made payable to ISE-OSU. ☐ Please charge my gift to my credit card.

☐ Visa ☐ MasterCard Card #: _____ Expiration Date:_____

Signature: _____

Mail to ISE, 224 Baker Systems, 1971 Neil Ave., Columbus, OH, 43210-1275, Attn.: Candi McCain

If you would like more information on ISE, or would like to discuss other opportunities to assist the Department, please contact Director of Development Candi McCain, at mccain.3@osu.edu or 614-688-8241.

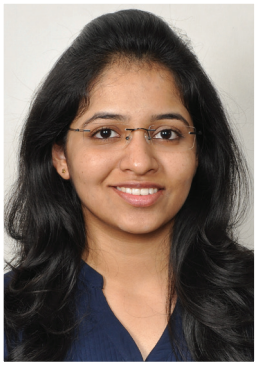
Meet the Supply Chain Management Graduate Scholarship Recipients

Recently, the Integrated Systems Engineering Department added a master's level track for supply chain management and logistics. Upon hearing the news, one OSU alumnus, who wishes to remain anonymous, was prompted to establish The Supply Chain Management Endowed Graduate Scholarship Fund for graduate students in the Department's master's of science degree program who are specializing in supply chain management. Shruthi Thirupathi and Jiajun Ying have been named recipients of the fund. We asked Shruthi and Jiajun to share a little bit about themselves, what the scholarship means to them and their ISE plans while at OSU and beyond.

Shruthi Thirupathi

Where is your hometown?
Mysore which is in the state of Karnataka, India

When did you know that you wanted to be an engineer?
Coming from a family of engineers, I used to be surrounded with people talking about technical stuff most of the time. Commencing from the days of my high school education, I closely followed my father's work on Manufacturing Management techniques for his doctoral degree in Industrial Engineering. Gradually, my interest grew in the area of Industrial Engineering.



Where did you obtain your undergraduate degree?
I got my bachelor's degree in 2014 from Sri Jayachamarajendra College of Engineering, Mysore, a reputable college in Karnataka.

What was your field of study for your undergraduate degree?
I majored in Industrial and Production Engineering.
Did you participate in any research activities?
My interest in the research field was deepened by my mother and father who have doctorates in the fields of Electrical Engineering and Industrial Engineering, respectively. And I was blessed with an opportunity to work under a research scholar during my third year of engineering in the field of Management Information Systems. During this period, I co-authored two research papers entitled, "A Study on Development and Implementation of a Computerized Maintenance Management Information System for a Process Industry" and "Case Study on Comparison of Usage and Acceptance of Management Information System in Medium Scale and Large Scale Organization" which were published in International Journal of Engineering and Innovative Technology (IJEIT).
Also, I presented a paper titled, "Management Techniques as Applied to National Safety and Security" at the IX ISTE (Indian Society for Technical Education) Karnataka State Student Annual Convention, highlighting the concepts of Six Sigma and Lean Manufacturing.

Why did you choose OSU for grad school?
The specialization area in Logistics and Supply Chain Management that is being offered very closely correlates with my interest area. A distinguished team of faculty, the research being undertaken and the courses offered in the field of Logistics & Supply Chain Management at The Ohio State University's ISE Department made me choose this university for my grad school.

What are your post-graduation plans?
To look for a job that best suits my interests and to be able to deliver to the best of my abilities and to bring a change to improve the existing functionality and procedures that are in place in Supply Chain Management.

What is your dream job?
For me, a dream job would be a job which allows me to work in the area of my interests which are Logistics and Supply Chain Management and which helps me to apply my knowledge and skills that I would have picked up during my master's into a practical environment.

What is the best advice that you have received?
It was from my mother who has always been an inspiration to me. If I recall it properly, it happened when I was troubled and puzzled about many aspects in life. She said, "Build the courage and strength to be able to live a life wherein you are true to yourself and not based on what others are expecting of you."

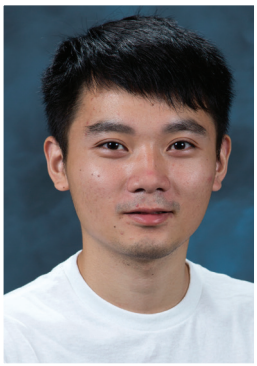
As a recipient of this scholarship, is there a message that you would like to relay to the donor?
I feel very honored to receive the Supply Chain Management Graduate Scholarship. I am very grateful that I have been bestowed with this scholarship, and it is a huge encouragement for me.

Any other comments that you would like to share?
I feel extremely humbled and proud for getting admitted to OSU's master's program.

Jiajun Ying

What is your hometown?
Hangzhou, China

When did you know you wanted to be an engineer?
When I was a child, I remembered that I came to a factory, and the environment of this factory is messy and smelly. I hated such a feeling. At that moment, I wanted to change such a situation. The way to get this targeted is to be an engineer.



Where did you obtain your undergraduate degree?
I obtained my degree at Zhejiang University of Technology.

What was your field of study for your undergraduate degree?
My undergraduate major is Industrial Engineering.

When did you graduate?
June 25, 2016, I graduated from Zhejiang University of Technology.

Did you participate in any research activities?
I had been the research assistant for my tutor from January to July 2014, the name of the project is, "Modeling of Workshop Layout for Polymorphism Job Shop and Robust Collaborative Optimization Oriented to Low Entropy – The National Natural Science Foundation of China." My responsibilities were documenting consulting and incorporating data collection and management.

Why did you choose OSU for grad school?
Because this university is a nice university, ... [it] can give me many chances to touch the professor who is the expert in ISE. And, of course, this university has many Chinese students.

What are your post-graduation plans?
When I got my bachelor's degree, I wanted to continue to learn more knowledge about ISE, so I came to OSU. And, if you ask me about getting the master's degree, I am going to work. I want to utilize my knowledge in actual production.

What is your dream job?
To be an ISE Engineer to improve production situation, balance supply chain of different companies, and so on.

What is the best advice that you have received?
Never say impossible.

As a recipient of this scholarship, is there a message that you would like to relay to the donor?
I want to say thank you to the donor. I will study hard and do my best during the period of graduate school. I won't let the donor be disappointed.

Are there any other comments that you would like to share?
I'm looking forward to studying at OSU.

Second-generation Buckeye, Brazil native at home at Ohio State

This past summer, ISE undergraduate student Alex Pires got a chance to apply his classroom knowledge on the job. During an internship with DHL Supply Chain in Westerville Ohio, he utilized re-engineering and process improvement efforts at different warehousing sites around Columbus.

“With this, I was able to experience many different facilities, systems and operations, which showed me how diverse and exciting a career in this industry would be,” says Pires, a senior from Piracicaba, São Paulo, Brazil. “After this experience, I’m looking forward to pursuing employment in supply chain once I graduate.”

The internship solidified his interest in supply chain, with Pires finding it to be, “an ever-evolving business that is increasingly implementing technological solutions in everyday operations.

“Every day is unique, and there are always different problems to solve. It is very fast-paced, and there is never a boring day.”

Pires is an engineering honors student, who was awarded an International Scholarship for Academic Excellence. He is treasurer of the Human Factors and Ergonomics Student Chapter at OSU, and says he decided to be an engineer while in high school. “I had a physics teacher that showed me how interesting and fascinating the field really is, and all of the real-life applications of different engineering disciplines,” he says. “Through that, I knew that engineering was a good fit for my personality and academic skills.”

Choosing to come to The Ohio State University was an easy decision for Pires. “Both of my parents got their PhD degrees here at Ohio State, so they’ve been Buckeyes ever since,” he says. “When applying for college, I did a college tour here and fell in love with the school’s atmosphere, and knew it was the right place for me.”

One of the highlights of his time on campus has been working in the Human Factors and Ergonomics Laboratory. “During my time there, I learned important skills about how to do research projects and how to conduct experiments, and that’s how I got involved with the Human Factors and Ergonomics Society that I’m a part of now. I’ve built great friendships and professional connections through it, and have had great experiences because of it,” he says.

Pires says his dream job would be a managerial position at an engineering firm, and he encourages other students to work to achieve their dreams. “Being born and raised in Brazil, I’ve always wanted to come to college in the United States, and always worked toward that goal, until one day it became reality. Coming here, specifically to OSU, was the best decision I’ve ever made, and I would tell anyone that isn’t decided on where to go to school that OSU is the right place to be.”

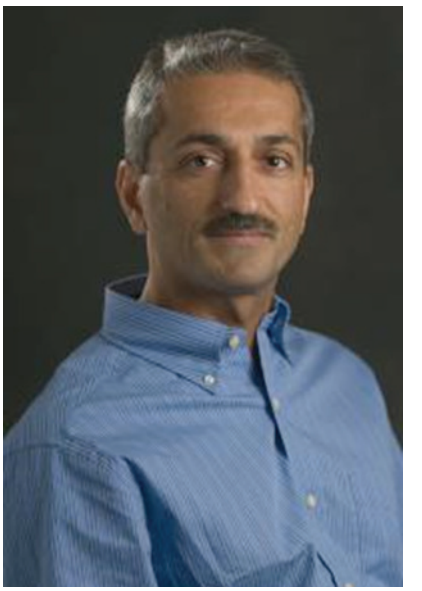
Research Opportunities Attract Farhang Pourboghrat to OSU

The opportunity to work for the Center for Design and Manufacturing Excellence was a big draw in attracting Dr. Farhang Pourboghrat to leave his position as a faculty member in the Mechanical Engineering Department at Michigan State University for a joint appointment as a professor of Integrated Systems Engineering and Mechanical and Aerospace Engineering at The Ohio State University.

Dr. Pourboghrat says he is particularly interested in the opportunities for research available at OSU, specifically in the manufacturing arena. At Ohio State, he also hopes to promote the idea of bringing more undergraduate students into the research labs. “I’m definitely an advocate of hands-on experiences for students,” he says, “particularly on the manufacturing side of things – more specialty modeling of materials and impact.”

So far, he has enjoyed the interaction that he has had with the students and the sense of collegiality with his colleagues and “the care they put into teaching.” Dr. Pourboghrat was known as a popular professor at MSU having won the John D. Withrow Teaching Excellence Award in 2002.

> “I’m definitely an advocate of hands-on experiences for students.”
>
> Dr. Farhang Pourboghrat
>
> *Research Associate Engineer*



He earned his BS and MS degrees from the University of Iowa and a PhD in Mechanical Engineering from the University of Minnesota. He also has experience as a staff scientist at the Alcoa Technical Center.

Dr. Pourboghrat’s research interests are in the multi-scale characterization of engineered materials and modeling of advanced forming processes, including warm forming of sheet metals and tube hydroforming. His research has a strong emphasis on the computational modeling of metal forming processes using crystal plasticity and advanced phenomenological yield functions.

He is a member of American Society of Mechanical Engineers and the Sigma Xi Technical Honor Society. He has served as a member of the Steering and Scientific Committee for the Numerical Simulation of 3D Sheet Forming Processes (NUMISHEET) Conference since 2005.

Dr. Pourboghrat currently is working on a website where he will showcase the research that he is conducting with students. He hopes to have it online by mid-September and plans to link it from the ISE website.

Student Groups Keep BuckISE Active, Engaged

In addition to academics, ISE students are involved in a host of activities organized by student chapters of national organizations devoted to their future professions. Here's a sampling of some of the events that keep BuckISE busy.

Institute of Industrial and Systems Engineers

The year started off on a positive note with the fourth annual Leadership Summit Jan. 30 with more than 200 students gathering at the Blackwell Inn to hear from OSU ISE alumnus and Pizza Hut COO Rob Savage and keynote speaker Tim Kight, the leadership coach for the Ohio State football team and CEO of Focus 3.

Thirty OSU IISE students and Professor Aimee Ulstad attended the 2016 Great Lakes Regional Conference Feb. 19-20 at Wayne State University in Detroit. Placing second in the Card Sorting Competition were Collin Callahan, Katie David and Rachel Nash. Christina Steiner took third place in the Shark Tank Competition. Brett Blackwell and Lex Clark also participated in the Shark Tank competition.

In April, Ohio State Institute of Industrial Engineers (IIE) joined the national switch and changed its name to the Institute of Industrial and Systems Engineers (IISE).

ISE social engagements have included ice-skating get-togethers, monthly happy hours at Ruby Tuesdays, a dodgeball game with the ISE Cohort Program, a IISE intramural soccer team and a trip to the Columbus Zoo.

For more information, visit **OhioStateIIE.org.**

Ohio State IISE members pose at the 2016 Great Lakes Regional Conference. At the conference, a unanimous vote determined that the 2018 conference will be hosted by the OSU chapter.

The National Society of Black Engineers received the highest honor, the Overall Outstanding Student Organization award and a $1,000 prize at the second annual OSU Student Organization Recognition & Awards ceremony Feb. 17, 2016 in recognition of the breadth and quality of activities. NSBE also received the Diversity & Inclusion Enhancement Award for demonstrating an inclusive mindset and culture through their activities.

Members of the Society of Women Engineers, from left to right, Lena Schmidt, Alisa Noll, Jasmine Johnson and Jaclyn Thomason take the Buckeye spirit to the Region G Conference in Cincinnati in Februrary.

Society of Women Engineers

A non-profit educational and service-oriented professional organization that promotes the development of women in STEM fields, the Society of Women Engineers (SWE) at Ohio State provides networking and career opportunities; engineering outreach, including Junkyard Battles and Discover Engineering days; mentoring through Big/Little SWEsters program; social events and scholarships.

During the 2015-2016 academic year, SWE hosted an ice cream social after the fall involvement fair for new members to learn more about SWE, its annual career fair in the spring, an apple picking outing, a big/little gallery hop and a big/little craft night.

The chapter also sent members to the Region G Conference in Cincinnati and the annual SWE Conference in Nashville. In addition, OSU SWE hosts an annual 5k and a volleyball tournament fundraiser with all proceeds

To learn more, visit **SWE.org.**

National Society of Black Engineers

The mission of the National Society of Black Engineers (NSBE) is to increase the number of culturally responsible Black Engineers who excel academically, succeed professionally and positively impact the community.

The Ohio State University Chapter will be represented at the Region 4 Conference in Rosemont, Illinois Nov. 17-20, seeking research, internships, co-ops and full-time opportunities.

For more information, on NSBE, visit **nsbe.org.ohio-state.edu**

To learn more, visit **SWE.org.**

Big Data and Analytics Association (BDAA) President Derek Sasthav, left, and Vice President Alisa Noll pose with the 2016 Student Organization Excellence Award for Innovation & Change, presented by the OSU Office of Student Life. BDAA's goal is to inspire students to think analytically and empower them through hands-on training, and connect them to potential employers.

Big Data and Analytics Association

Student members of the Big Data and Analytics Association or BDAA, have had a variety of industry activities to choose from, including:

- Financial Analysis Case Competition with AMEND Consulting
- Tech Talks with: Cardinal Health, CAS, Northwestern Mutual, LexisNexis and IBM
- Workshops on: Introduction to Data Science, Big Data, Scraping the Internet for Data and Machine Learning
- Networking Night with the Columbus Start-up Community featuring more than 60 students and 120 professionals in attendance

Derek Sasthav, president of BDAA, says upcoming events for Fall semester include:

- Data Analytics Networking Night with 30-plus companies in attendance
- Intro to Data Science Workshop, Nov. 12-13
- Visits by representatives from Cardinal Health, Nationwide, Huntington Bank, Lubizol, Capital One and more.
- Various hands-on workshops to get students acquainted with data science.

For more information, visit **BDAAatOhioState.org.**

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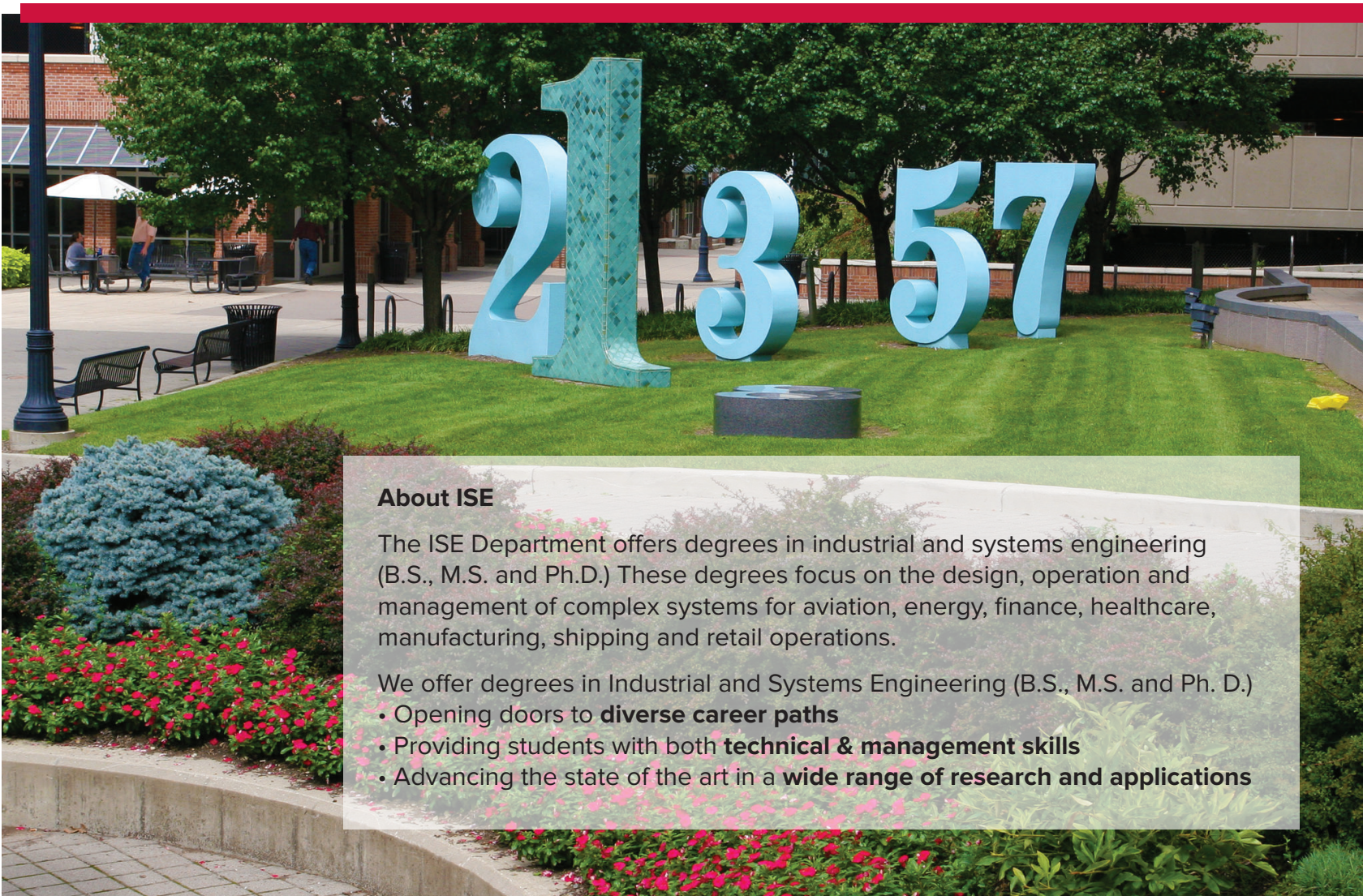

About ISE

The ISE Department offers degrees in industrial and systems engineering (B.S., M.S. and Ph.D.) These degrees focus on the design, operation and management of complex systems for aviation, energy, finance, healthcare, manufacturing, shipping and retail operations.

We offer degrees in Industrial and Systems Engineering (B.S., M.S. and Ph. D.)

- Opening doors to **diverse career paths**
- Providing students with both **technical & management skills**
- Advancing the state of the art in a **wide range of research and applications**