

WIND ENERGY MANUFACTURING LABORATORY OPENED

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Terpenny Will Lead IMSE

Dr. Janis Terpenny was selected as the new chair for the Department of Industrial and Manufacturing Systems Engineering at Iowa State. She will also be the inaugural holder of the Joseph Walkup Professorship in IMSE.



Janis Terpenny

Terpenny is a professor in the Department of Mechanical Engineering and in the Department of Engineering Education at the Virginia Polytechnic Institute and State University. She is also a faculty affiliate in Virginia Tech's Department of Industrial and Systems Engineering. Currently, Terpenny is on a rotational appointment as a program director for the Division of Undergraduate Education with the National Science Foundation (NSF) through August 2011, when she will join the IMSE Department at Iowa State.

Her research addresses how engineered products are designed, including methods, processes, and tools to support the early design stage. Specifically, Terpenny studies the capture of knowledge and information in design, product families and platforms, the prediction and management of product obsolescence, complexity in product design and life cycles, as well as critical challenges in design education. Her research draws from the experience she gained while working at General Electric and additionally from a variety of projects she has completed for small and large industrial partners.

Max Morris has served as interim chair of IMSE. Morris succeeded **Gary Mirka**, who was named the College of Engineering's associate dean for undergraduate and graduate education.

Morris holds a joint appointment in the Department of Statistics and IMSE. Prior to joining Iowa State, he served 17 years as a research staff member at the Oak Ridge National Laboratory and also held faculty appointments in the Department of Statistics at Mississippi State University and Department of Pathology at the University of Texas Health Sciences Center at San Antonio.

In his new position with the college, Mirka oversees student services, which includes undergraduate recruiting, classification, and scholarships; international engagement; community-based recruiting and transition; and graduate recruiting and administration.



Gary Mirka

Greetings from IMSE!



Thank you for reading the 2011 newsletter of the Department of Industrial and Manufacturing Systems Engineering at Iowa State University. I hope you enjoy this update on the recent activities and accomplishments of our students, faculty and alumni.

IMSE has been active in the area of curriculum development over the last few years. Our new Sales Engineering minor for undergraduate students won an IIE Innovations in Curriculum Award in 2010. Plans are well under way for a new Master's degree in Engineering Management. Also, we continue to develop and expand our distance education programs to enable students to pursue degrees at other locations.

Our students continue to be points of pride for the department. The ISU chapter of IIE hosted the 2011 IIE North Central Regional Conference in Ames. In addition, be sure to check out the story of how Leslie Potter's IE 441 class, Capstone Design, worked with three of Iowa Health System's Des Moines hospitals to improve their operations.

The newly opened Wind Energy Manufacturing Laboratory is a major research facility for IMSE faculty, and is also a key component in our joint research work with others in the College of Engineering.

I welcome any feedback you may have to this newsletter. Please feel free to call the department office (515-294-1682), email me directly (mmorris@iastate.edu), or drop by to see us in Black Engineering when you are in Ames.

Sincerely,

Max D. Morris
Interim Chair

On the cover:

The Wind Energy Manufacturing Laboratory opened for research in Sweeney Hall. The laboratory provides climate-controlled research space and offices for graduate and undergraduate research assistants.

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Senior Design: What the Doctor Ordered

What do you do when you're the sixth largest nondenominational health system in America with 20,000+ employees trying to "deliver the best outcome for every patient every time," and you have more opportunities for improvement than you have resources? You call upon Iowa State University's IMSE senior design students as a prescription for improvement.

In the Fall 2010 semester, three of Iowa Health System's Des Moines hospitals (Lutheran, Methodist, and Blank Children's) partnered for the second time with the IE441 senior design capstone course, providing outstanding project opportunities for soon-to-be graduating IE's. Projects included the implementation of lean philosophies in areas such as pharmacy and kidney dialysis layout, blood pressure monitor and IV equipment inventory control, sterilization process improvement, and appointment scheduling and lead time reduction.

Eight different student teams spent a productive semester defining the problems at hand, identifying measurable objectives, and working through methodical (and challenging!) steps to accomplish tangible deliverables. They presented their final recommendations to representatives from Iowa Health Systems in December both face-to-face in Ames and via teleconference to company personnel in Des Moines.

The "value-added" assessment of the projects by Iowa Health Systems was high, and for this distinction, Iowa Health donated a percentage of the expected savings identified by the student groups back to the course. The donation will be put into the senior design laboratory, with plans in place for expanding both the size and the computing resources in the lab. In addition, the lab library will be expanded to include additional lean implementation resources.

"One of the neat things about working with Iowa Health is that they are serious about implementation," said **Leslie Potter**, senior lecturer and instructor for capstone design. "Our students presented their final recommendations to Iowa Health on December 7th, and by December 23rd, I had an email from the hospitals saying they had implemented one of the inventory/visual management projects 'painlessly' and that it was a 'huge win' for both patients and staff. Our students understand their projects matter and that their solutions must be feasible and add value to the organization. It's rewarding for everyone to have such success all the way around."

According to Val Boelman, Process Improvement Coordinator at Iowa Health, "We have heard nothing but positive feedback from the staff who worked with the students. They thought it was a great experience and expect to see great outcomes as a result of the work."

Wind Energy Manufacturing Laboratory Opened

The Wind Energy Manufacturing Laboratory (WEML) is the newest and largest laboratory space in the IMSE department. This new facility contains over 2500 square feet of high-bay research space, climate-controlled research space and offices for graduate and undergraduate research assistants.

Located in 1310 "old" Sweeney, this space was renovated from what was once a massive corridor between the solar car garages and the glass blowing shop. In order to make the space work, the project involved building a new exterior door to the glass blowing shop, removing a massive steel structure relic from past chemical engineering days, lots of fresh paint, lights, doors and a security system. The space is very unique on campus, it is very long, has a ceiling height close to 30 feet, and has a garage door on one end; few people could use such a space as well as researchers trying to manufacture massive wind turbine components. Although the research team would never bring a full 40-plus-meter-long turbine blade inside, there is a wealth of research that can be conducted on smaller-

scale blades, on the order of 9 meters long.

Commissioned in October 2010, the team has settled in and begun pumping out some exciting new technologies. Research problems being addressed include the following: 1) How can one determine sources of dimensional variability in such a large product, 2) How can we automatically and cost effectively deposit flexible fiberglass fabric into complex 3D molds and 3) How can we inspect blades using Non Destructive Evaluation (NDE).

The new lab provides the unique opportunity to test new solutions to these questions at a quarter scale, using smaller versions of the molds involved in creating mega-watt class fiberglass turbine blades. With a current focus on improving the manufacturing of large turbine blades, the team already has one patent-pending machine developed in the lab; a machine that reduces a current several man-hour-long process to mere minutes. Results of their research will be shown at the American Wind Energy Association (AWEA) WindPOWER conference, where two

posters were presented amid an attendee list of over 20,000 in Anaheim, California.

The current research efforts are part of a \$6.3 million dollar project with Sandia National Laboratories and TPI Composites. Sandia labs are part of the U.S. Department of Energy, while TPI Composites is a company headquartered in Scottsdale, Arizona, with its newest blade facility located in Newton, Iowa. Funding for the project comes from the US DOE, TPI Composites and the State of Iowa Power Fund.

Although the WEML lab was built in response to this project, the team has plans for other research. New projects are being sought in two primary areas: large offshore wind turbines, where blade sizes can grow to the 70-100 meter range, and wind turbine tower manufacturing research to create taller towers. In either case, the goals are similar, making wind energy cost effective through manufacturing technology improvements that make the systems lighter, cheaper and more reliable; things IEs are usually pretty good at.

In Focus: Dave Sly

Dave Sly, PE, MBA, appreciates splitting his time between his roles as lecturer for IMSE and president and founder of Proplanner, a manufacturing process engineering and management software firm. His students benefit from his variety of interests, as well.

"I really like the interactivity: the fact that I can be out in industry on a real problem on Thursday, and I can tell the students about what it was like on Friday," Sly said. "Teaching the courses over the years makes me a better researcher in the field, and my research has made me a better instructor."



Dave Sly teaches IE 305: Engineering Economic Analysis

Iowa State Hosts Institute of Industrial Engineers Regional Conference

Iowa State hosted 200 students and industry professionals at the IIE North Central Regional Conference from March 31 to April 3. Fifteen ISU Industrial Engineering students on the planning team organized the event, under the leadership of Laura McMullen and Sydney Smith. The students reserved facilities, organized plant tours and educational speakers, and planned social activities for the student guests from 10 universities.

Many industry professionals were also involved in the event. Representatives from HON, John Deere, Proctor and Gamble, Pella,

and Proplanner spoke to the students about industrial engineering roles at the companies.

Dr. Matt Frank and Dr. Rick Stone spoke about their research and work in industrial engineering. The support given to the planning committee by IMSE staff was essential in creating a successful conference.

The conference was a great opportunity for the chapter to get involved with the IIE national organization, and to present themselves as an outstanding student organization.

Before finding his calling in industrial engineering, Sly came to Iowa State to obtain a degree in electrical engineering. He recalls the driving force for his decision.

"Back then, robots and computers were really new and popular, and I was excited about them," Sly said. "I found out later that industrial engineers were the ones who actually implement the robots and program them, and that's what I wanted to do."

With the switch to industrial engineering, he went on to receive his BS, MS, and eventually his PhD, as well as an MBA. During that time, he was also running his company that was based on his master's thesis. The products of Proplanner are designed to assist manufacturers of complicated assembled products with streamlining and planning production systems and operations.

"Basically, the software manages the entire data set of what is thought of as the 'knowledge of industrial engineering data,'" Sly said.

The products are used in more than 100 universities and more than 800 companies in 36 different countries around the world. John Deere, CASE, Ford, GM, Freightliner Trucks, Briggs & Stratton, and Electrolux are just a few of the companies that use Proplanner's software.

While running such a successful company, Sly also recently helped to develop the new technical sales minor program. The courses in the program give engineering students the tools to be more marketable to employers who are looking for engineers that will be able to build and sell the increasingly complicated products.

“The old-school model was that a company would put a sales person and an engineer out in the field, but that isn’t very efficient. Why can’t engineers be taught the skills of sales? The idea is that if an employee can do both, the company can hire a more efficient person and a more cost-effective person,” Sly said.

Many U.S. universities have yet to develop a technical sales program, and Sly realized that if Iowa State had a program, it would give ISU students advantages in the field.

"The more effective they are in selling a concept they have to management, the more valuable they will be," he said.

Engineering sales program brings industry perspective to students

Introducing engineering students to a less traditional career path, Iowa State's program in technical sales quickly evolved from the IMSE department having two courses in the subject to an increasingly popular minor and strong student organization.

The program in technical sales offers engineering students the opportunity to learn about sales techniques and strategies, as well as concepts such as market analysis, technical product pricing, persuasive communication, and new technology introduction as they relate to engineering.

The minor consists of five courses. Three of these courses are in industrial engineering—engineering economics, technical sales 1 (technical selling), and technical sales 2 (sales management). The remaining two courses are offered by the College of Business—personal selling and marketing.

In addition to an understanding of the sales engineering profession, Blair Punt, senior in industrial engineering and vice president of the Sales Engineering Club (SEC), says involvement in the program has given him a great opportunity to network with potential employers on several different occasions. "Our instructor often invited sales engineers from industry to share during classes," Punt said. SEC also offers networking and professional development opportunities that connect students with sales engineers.

This strong relationship with industry has been present in the program from the very beginning. With a donation from Trane, a leading global provider of indoor comfort systems and solutions and a brand of Ingersoll Rand, the College of Engineering was able to conduct preliminary research necessary to get the program off the ground.

“Partnering with industry early in the process gave us a great deal of insight that came directly from organizations that hire our students for careers that include technical sales and marketing,” said Dave Sly, instructor of the technical sales courses. The program continues to

maintain and develop such partnerships to increase value for students.

Additionally, those in the program also appreciate the broad applicability of the coursework, noting that all engineers can benefit from the lessons. "Even if someone is planning to go into a more traditional engineering role, these classes show how to effectively sell yourself and your ideas," he said. "It will also give students an appreciation for all of the work that goes into selling the products engineers traditionally create."

Punt will be starting a full-time position with Ingersoll Rand in their Sales Development Program this summer and is looking forward to the opportunity to learn about selling the company's industrial products, as well as the opportunity for travel the position provides. "Early on in the coursework I learned to view sales people as similar to consultants," he said. "They work with customers on very technical projects to really help them get a product that will benefit them. It's going to be great to be in that role with this company."

Iowa State's technical sales program won the 2010 Institute of Industrial Engineers Innovations in Curriculum Competition award. The award highlights outstanding innovation in the design or presentation of an accredited industrial engineering, industrial and systems engineering, industrial engineering and operations research, or similar engineering curriculum, or in a course that is part of an accredited curriculum. It recognizes faculty members who demonstrate outstanding creativity in instructional approaches or curriculum organization, design, or content, and who provide evidence of the effectiveness of their innovation. A follow-up paper is now in process for submission to the American Society for Engineering Education.

"We're excited this program is getting recognition at a national level," said Sly. "We have had a lot of success so far and want to continue to build our program to meet the needs of industry and interest of our students."

Contributed by Engineering College Relations

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Visiting students from 10 universities attended the conference.

Your support makes a difference!

Generous gifts from our alumni, corporate sponsors, and other partners enable the IMSE department to continue enriching our program. Please consider making a gift, as your contributions make a lasting impact on the success of our students through initiatives that include

- Providing scholarships and fellowships for recruiting and retaining students
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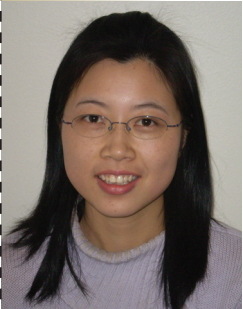
IMSE Advisory Council

- Left to right:
- Bill Dunlay (attending in place of **Michael Schneider**, Alcoa Davenport Works)
 - **Eric Ervin**, J.B. Hunt Transport, Inc.
 - **Kara Hobart**, General Mills
 - **Wayne Flory**, Rockwell Collins, Inc.
 - **Skip Barrick**, Pella Corporation
 - **Nathaniel Harris**, John Deere Waterloo Works

The IMSE Industry Advisory Council gives the department advice in many aspects of departmental strategy and operations.

- Not in attendance at the March 25th meeting:
- **Alan Anselman**, Lennox Manufacturing
 - **Mike Trachta**, Mercy Medical Center - Cedar Rapids

Faculty and Staff Updates



Guiping Hu became an assistant professor in IMSE at the beginning of 2011. She initially joined the department as a lecturer in 2009, after completing her PhD at the University of Pittsburgh earlier that year. The change of title reflects a broader job definition, to include research and mentoring of graduate students in addition to classroom teaching.

Since joining IMSE, Dr. Hu has taught courses in Engineering Economic Analysis, Engineering Problem Solving, and Logistics and Supply Chain Management. Her research interests include applying operations research, statistics and economic analysis methodologies to sustainable supply chain management, sustainable agriculture and bio-energy analysis problems.

One of her projects is entitled “Mapping Potential Foodsheds in Iowa: A System Optimization Modeling Approach,” and is funded by the Leopold Center for Sustainable Agriculture. The goal of this project is to gather information on the dietary needs of population centers in Iowa, determine each area’s capabilities to grow food locally and create an optimization model that maps the food supply and demand throughout the state. Dr. Hu is also actively working on techno-economic and life cycle analysis of various biofuel production pathways.

Lynn Franco will be leaving the IMSE department this fall after working 30 years with the department. She will be missed by everyone in the department. She will retire in August 2011.

Alex Rausch joined the IMSE staff as a communications specialist in April 2011. Her time is divided between the Mechanical Engineering Department and IMSE.

Awards and Honors

Morris Receives Frank Wilcoxon Prize

Max Morris, along with coauthors Brad Dilts (formerly of the Department of Agricultural and Biosystems Engineering), Stuart Birrell (Department of Agricultural and Biosystems Engineering) and Philip Dixon (Department of Statistics) were selected to receive the Frank Wilcoxon Prize for their paper “Composite Response Surface Designs for Factors with Jointly Symmetric Effects” that appeared in the May 2009 issue of *Technometrics* (pages 206-214).

The Wilcoxon Prize is an annual award given to the best practical application paper appearing in the previous year’s issue of *Technometrics*, the leading journal of statistical methodology developed for problems in engineering and the applied sciences. The prize was presented at the 2010 Fall Technical Conference (FTC) of the American Quality Association, held October 7 and 8 in Birmingham, Alabama.

The paper reported on experimental work undertaken as part of a research program to design improved agricultural combine machinery. Combines separate grain from “MOG” (material other than grain) through a complex system of fans, baffles, and surfaces that produce a fluidized bed – a turbulent mixture of air and grain. Efficiency of the process is influenced by the interaction of environmental conditions, including the angle of the ground on which the combine is operating, with operational parameters of the machinery, including fan speed and the adjustable angles of control surfaces.

The *Technometrics* paper describes an approach to designing laboratory-scale experiments that allow more efficient estimation of these interactions than conventional experiments, made possible by taking into account geometrical symmetries in the machinery design and its interaction with gravity. The longer range goal of the research program is the design of real-time control algorithms that will increase the proportion of grain collected, and reduce the proportion of MOG collected with the grain.

IMSE Student Awarded Gilman International Scholarship

Erica Jensen, a junior in industrial engineering, has been selected to receive a Benjamin A. Gilman International Scholarship toward her study abroad experience this fall and spring semesters.

The Gilman International Scholarship Program is a highly competitive national study abroad program that offers grants for U.S. citizen undergraduate students of limited financial means to pursue academic studies abroad. Such international study is intended to better prepare U.S. students to assume significant roles in an increasingly global economy and interdependent world.

Jensen is currently studying abroad at the National University of Singapore. She is optimistic about the experiences studying abroad creates for students. “There are many things to gain from studying abroad such as understanding another culture firsthand, providing the opportunity to travel, developing skills that cannot be acquired in a classroom setting, enhancing job opportunities, and expanding a person’s world view,” she said.

Jensen plans to study abroad at Swansea University next semester and will return to Iowa State to finish her final year of college where she wants to continue to play an active role within the industrial engineering program.



In Brief

Wutthigrai Boonsuk, a 2009 PhD graduate under the direction of **Matt Frank**, received an Emerald Literati Network 2010 Award for Excellence for his article published in the Rapid Prototyping Journal. **Dan Bumblauskas**, a recent PhD graduate under the direction of **Doug Gemmill**, won the 2010 Best Paper award in the Graduate Studies Division at the American Society of Engineering Education conference. **Xiaopeng Ning** a PhD student in the department under the direction of **Gary Mirka** received the 2010 Industrial Ergonomics Technical Group (IETG) 2010 Student Paper Award.

In addition, in 2009 and 2010 our graduate students authored 26 journal articles and 27 conference proceedings papers.

Frank Peters, **Dave Sly** and **Dan Bumblauskas**, Institute of Industrial Engineers, Innovations in Curriculum Award, for the Sales Engineering Program in 2010.

The **Don Grant Faculty Award for Excellence in Undergraduate Education** is given to a faculty member in the department who is recognized by students as having a high impact on undergraduate education in the IMSE department. The undergraduate industrial engineering honor society, Alpha Pi Mu, selects the winner of this award.

Leslie Potter
2010 Don Grant Faculty Award
Dave Sly
2011 Don Grant Faculty Award

IE Alum Named Senior Vice Provost at Cornell

Ronald Seeber (ISU BSIE’75) was named senior vice provost at Cornell University effective July 1. He combines the full-time position with his duties as professor and associate dean at the School of Industrial and Labor Relations (ILR) and associate director of the Martin and Laurie Scheinman Institute of Conflict Resolution.

Seeber came to Cornell in 1980 as an assistant professor and has served as an associate dean of the ILR school since 1987. He was the director of ILR Extension from 1987 to 2000. Seeber helped found the Institute on Conflict Resolution in 1997 (now the Scheinman Institute) and served as its co-director from its founding to the present. He was appointed vice provost in 2005.

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The department offers two coursework-only master's programs that are convenient and flexible. Depending on your interests, you can pursue a master's of engineering degree in systems or industrial engineering—each offering you unique learning experiences that can change your career.

"I believe the online option is great for students because they don't have to quit their jobs to get a masters' degree -- they don't have to do it full time or live close to the university. They can do it on their own time, and at their own pace. I've had classmates or students I've known from New York, California, Florida, Pennsylvania, Indiana, Puerto Rico, and even the United Kingdom."

*—Ted Lockhart,
Principal Systems Engineer
with Rockwell Collins*

Systems Engineering

- Develop analytical and management skills needed to design, evaluate, and build complex systems
- Work across disciplinary boundaries
- Take systems engineering core courses, as well as advanced engineering and nonengineering electives

CONTACT: Doug Gemmill
515 294-8731
n2ddg@iastate.edu

Industrial Engineering

- Raise engineering knowledge and practice to the next level
- Gain both a broad and deep understanding of industrial engineering
- Take courses in operations research, manufacturing, and human factors, along with industrial engineering nonmajor electives

CONTACT: Lori Bushore
515 294-0129
bushore@iastate.edu