



THEN.NOW.NEXT

DEPARTMENT OF INDUSTRIAL ENGINEERING 2011 ANNUAL REPORT



UNIVERSITY OF
ARKANSAS

COLLEGE OF
ENGINEERING



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From the Department Head



Dr. Needy's research interests include engineering management, engineering economic analysis, sustainable engineering and integrated resource management. She teaches courses in engineering management. She joined the faculty in 2008.

Education:
Ph.D. (Wichita State University)
M.S.I.E. (University of Pittsburgh)
B.S.I.E. (University of Pittsburgh)

Dear Colleagues and Friends,

I would like to welcome you to the 2011 Annual Report from the Department of Industrial Engineering at the University of Arkansas. The department celebrated its 60th year in 2011. It was a year of growth and many new developments that we are excited to share with you. In 2001, at the mark of the department's 50th anniversary the department celebrated with the theme of "Industrial Engineering – Breaking Away, Paving the Way, and Leading the Way." The theme expressed the efforts that were made to distinguish IE from other disciplines, acknowledge the achievements being made through industrial engineering, and establish goals for the future of IE at the University of Arkansas. A decade later we are again examining Then, Now, and Next.

"Then" begins when Dr. John L. Imhoff was hired as head of the program in 1951 as the College recognized Industrial Engineering as a department of its own evolving from the mechanical engineering department. With gratitude and pride we can truly say the impact that Dr. Imhoff had on this department, the college, the campus and the IE profession is immeasurable.

"Now" we are an increasing, strong, nationally-ranked program with award-winning students and faculty and staff members! Our undergraduate and graduate enrollments continue to increase. Most notably, our Master of Science in Operations Management program is experiencing record enrollments while the program standards are being continuously raised. We have added Dr. Shengfan Zhang to our faculty and combined research efforts are resulting in more than \$2.3M annually.

"Next" we anticipate continued improvement and additional growth. We are excited to continue this upward trajectory as a department! This report highlights many achievements of our talented faculty, staff, students and alumni over the past year. In addition, it focuses on the Department's major thrust areas for which we are best known, namely transportation and logistics, healthcare systems, and quality and reliability engineering. Highlights of a few of the significant research accomplishments in these areas are shared.

In closing, I hope that you will enjoy examining our year in review. We are confident that you will be impressed with what you see. We invite you to contact us for further information or even better yet, stop by for a visit.

Warmly,

Kim LaScola Needy, Ph.D., P.E., CFPIM
Department Head and
21st Century Professor of Industrial Engineering

**Nebil Buyurgan, Ph.D.
Associate Professor**

Dr. Buyurgan serves as the Undergraduate Program Studies Chair. His research interests include Auto-ID technologies; RFID system optimization and data quality assessment; inventory control and management; auctioning methods; distributed control of large-scale systems; modeling and control of discrete event systems; modeling and analysis of flexible manufacturing systems; and automation and integration of advanced manufacturing systems. Dr. Buyurgan teaches courses in manufacturing design, processes and system analysis. He joined the faculty in 2004.



Education:

- Ph.D. (University of Missouri - Rolla)
- M.S.E.M. (University of Missouri - Rolla)
- B.S.I.E. (Istanbul Technical University)



**C. Richard Cassady, Ph.D.
Professor**

Dr. Cassady serves as Director of Freshman Engineering for the College of Engineering. His primary research interests lie in repairable systems modeling. He also conducts research in the areas of reliability engineering, statistical quality control and sports applications of operations research. Dr. Cassady teaches courses in reliability and maintainability engineering, operations research, probability and statistics, and statistical quality control. He joined the faculty in 2000.

Education:

- Ph.D. (Virginia Tech)
- M.S.I.S.E. (Virginia Tech)
- B.S.I.S.E. (Virginia Tech)

**Justin R. Chimka, Ph.D.
Associate Professor**

Dr. Chimka serves as the Graduate Program Studies Chair. His research interests include categorical data analysis, inventory control, statistical quality control, survival analysis and time series. He teaches courses in applied statistics, generalized linear models, optimization and production. Dr. Chimka joined the faculty in 2002.



Education:

- Ph.D. (University of Pittsburgh)
- M.S.I.E. (University of Pittsburgh)
- B.S.I.E. (University of Pittsburgh)



**Earnest W. Fant, Ph.D., P.E.
Associate Professor**

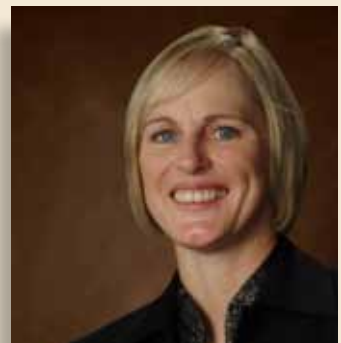
Dr. Fant's research interests include applications for machine-visioned robotics in automated production/processing and material handling systems and the application of operations research to in-plant logistics systems and warehousing. He teaches courses in robotics, machine vision, automated systems and renewable energy. Dr. Fant joined the faculty in 1988.

Education:

- Ph.D. (Texas Tech)
- M.S.I.E. (Southern Methodist University)
- B.S.I.E. (University of Arkansas)

**Carol S. Gattis, Ph.D.
Adjunct Associate Professor**

Dr. Gattis has been responsible for undergraduate student recruitment and taught courses in statistics, work methods and measurement, and engineering economics. She currently serves as the Associate Dean of the Honors College. Dr. Gattis joined the faculty in 1991.



Education:

- Ph.D. Engineering (University of Arkansas)
- M.S.E.E. (University of Arkansas)
- B.S.E.E. (University of Arkansas)

**Steven L. Johnson, Ph.D., PE, CPE
Professor**

Dr. Johnson's research interests have spanned the continuum from occupational ergonomics (e.g., hand tool design, reduction of musculoskeletal disorders, development of computer-based job analysis systems) to in-vehicle information, communication and entertainment systems in commercial trucks and automobiles. His current research involves modeling driver workload, evaluating lane-departure systems and investigating the effect of heavy truck/automobile speed differentials on highway safety, efficiency and economics. He teaches courses in human factors engineering/ergonomics, quality control and design of experiments. Dr. Johnson joined the faculty in 1982.



Education:
Ph.D. (SUNY at Buffalo)
M.S. Human Factors (University of Illinois)
B.A. Psychology (University of South Dakota)



**Russell D. Meller, Ph.D.
Professor**

Dr. Meller is Hefley Professor of Logistics and Entrepreneurship and serves as the Director of the Center for Excellence in Logistics and Distribution (CELDi). His research interests include facility logistics, facility layout, material handling, logistics system design and operations research applications to healthcare logistics. Dr. Meller teaches courses in facility logistics and material handling. He joined the faculty in 2005.

Education:
Ph.D. (University of Michigan)
M.S.I.O.E. (University of Michigan)
B.S.I.O.E. (University of Michigan)

**Ashlea Bennett Milburn, Ph.D.
Assistant Professor**

Dr. Milburn's research interests include applying operations research tools and techniques to problems encountered in healthcare and transportation systems. She is especially motivated by the modeling and analysis of challenges associated with the delivery of home healthcare. Dr. Milburn teaches courses in probability and statistics, healthcare systems, and transportation logistics. She joined the faculty in 2010.



Education:
Ph.D. (Georgia Tech)
M.S.I.E. (Virginia Tech)
B.S.I.E. (University of Arkansas)



**Heather Nachtmann, Ph.D.
Associate Professor**

Dr. Nachtmann serves as the Director of the Mack-Blackwell Rural Transportation Center and currently holds the John L. Imhoff Chair. Her research interests include economic decision analysis, cost estimation, intermodal transportation networks and engineering education. Dr. Nachtmann serves as Deputy Director of the Center for Innovation in Healthcare Logistics (CIHL) and teaches courses in the areas of engineering economy, cost and financial engineering, and operations research. She joined the faculty in 2000.

Education:
Ph.D. (University of Pittsburgh)
M.S.I.E. (University of Pittsburgh)
B.S.I.E. (University of Pittsburgh)

**Chang S. Nam, Ph.D., CHFP
Associate Professor**

Dr. Nam's research interests include haptic virtual environments, brain-computer interface, neuroergonomics, and organizational cognitive neuroscience. Dr. Nam teaches courses in human factors and ergonomics. He joined the faculty in 2004.



Education:
Ph.D. (Virginia Tech)
M.S.I.E. (SUNY at Buffalo)
M.A.B.A. (Sogang University)
B.S.I.E. (SungKyunKwan University)

Edward A. Pohl, Ph.D.
Associate Professor

Dr. Pohl's research interests include repairable systems, large-scale systems engineering and analysis, probabilistic design, risk and reliability, and engineering optimization. He teaches courses in quality control, engineering statistics, non-linear programming, heuristics, risk modeling, systems engineering and management. He serves as Director and Chair of Studies for the Operations Management Program and Deputy Director of the Center for Innovation in Healthcare Logistics (CIHL). Dr. Pohl joined the faculty in 2004.



Education:
Ph.D. (University of Arizona)
M.S. Reliability Engineering (University of Arizona)
M.S. Systems Engineering (Air Force Institute of Technology)
M.S. Engineering Management (University of Dayton)
B.S.E.E. (Boston University)



Chase Rainwater, Ph.D.
Assistant Professor

Dr. Rainwater's research interests lie in the areas of large-scale optimization, integer programming and supply chain logistics. In addition, he conducts research in areas of healthcare planning, homeland security and reliability. Dr. Rainwater teaches courses in probability and statistics, optimization and decision support systems. He joined the faculty in 2009.

Education:
Ph.D. (University of Florida)
B.S.I.E. (University of Arkansas)

Ronald L. Rardin, Ph.D.
Distinguished Professor

Dr. Rardin is the inaugural holder of the John and Mary Lib White Systems Integration Chair in Industrial Engineering. His research and teaching interests center on large-scale optimization modeling and algorithms, including their application in healthcare delivery, transportation and logistics, and energy planning. Dr. Rardin joined the faculty in early 2007 and directs the Center for Innovation in Healthcare Logistics (CIHL) in collaboration with industrial partners and healthcare providers.



Education:
Ph.D. (Georgia Institute of Technology)
M.P.A. Municipal Administration (University of Kansas)
B.A. Mathematics/Political Science (University of Kansas)



Sarah E. Root, Ph.D.
Assistant Professor

Dr. Root's research interests are in defining, modeling, and solving applied large-scale optimization problems. She is particularly interested in the application of optimization tools to problems encountered in healthcare and logistics. She teaches courses in operations research and service systems engineering. Dr. Root joined the faculty in 2007.

Education:
Ph.D. (University of Michigan)
B.S.I.E. (University of Pittsburgh)

Manuel D. Rossetti, Ph.D., PE
Professor and Associate Department Head

Dr. Rossetti's research is focused on the design, analysis and optimization of transportation, inventory, healthcare and manufacturing systems, using stochastic modeling, computer simulation, information systems and heuristic modeling techniques. He teaches courses in the areas of probability modeling, discrete event simulation, object-oriented and database systems, transportation/logistics modeling, and inventory modeling. Dr. Rossetti joined the faculty in 1999.



Education:
Ph.D. (The Ohio State University)
M.S.I.S.E. (The Ohio State University)
B.S.I.E. (University of Cincinnati)



John A. White, Ph.D., PE
Distinguished Professor & Chancellor Emeritus

After serving for eleven years as Chancellor of the University of Arkansas, Dr. White joined the faculty of the Department of Industrial Engineering full-time in 2009. A distinguished alumnus of the department, Dr. White teaches engineering economics, facilities planning, and queueing systems.

Education:

Ph.D. (The Ohio State University)

M.S.I.S.E. (Virginia Tech)

B.S.I.E. (University of Arkansas)

Dr. White also holds honorary doctorates from the Katholieke Universiteit of Leuven in Belgium and George Washington University.

Shengfan Zhang, Ph.D.
Assistant Professor

Dr. Zhang's research interests are mathematical modeling of stochastic systems with an emphasis on statistical and decision analysis as applied to health care, manufacturing and service environments. One of her research goals is to develop methods for addressing the complexity of breast cancer modeling in diverse populations in order to create more personalized screening and treatment strategies. Dr. Zhang teaches courses in advanced stochastic processes, decision modeling in health care, and quality engineering and management. She joined the faculty in 2011.

Education:

Ph.D. (North Carolina State University)

M.I.E. (North Carolina State University)

B.M. (Fudan University)



Photo courtesy of Carrie Pennington

Historic Engineering Hall, completed in 1927.

History of the Industrial Engineering Department



Photo courtesy of MaryAnn Bloss

In 1949, newly appointed Dean Branigan announced plans to offer the Bachelor of Science degree in Industrial Engineering. Working with Business Administration Dean Milam, advanced BA students in Industrial Management were given the opportunity to take additional engineering courses to qualify for the new degree. Several received the degree in 1950 and in 1951, including Charles Kittrell, later a Phillips Petroleum company vice president and prominent supporter of the University of Arkansas development office.

Dr. John Imhoff was hired as head of the program in 1951, coming from the IE option in the ME Department at

the University of Minnesota where he had coordinated the program. While a degree program had been announced at Arkansas, little implementation had occurred. Laboratory space was still non-existent, faculty were urgently needed, support funding was minimal, and no overall curriculum design had been developed.

While facing startup challenges, the new department made great progress during its first decade. It received full accreditation on its first attempt, as well as campus and national

recognition for its outstanding student professional and honor

society chapters. It started an effective MS program, played a leadership role in national Industrial Engineering developments through faculty offices at the national level in the AIIE and Alpha Pi Mu, developed a reputation for close faculty-student

relationships and graduated a large number of outstanding people.

The strong performance achieved during the fifties provided the platform for more rapid development of programs in the sixties. The student chapters of AIIE and Alpha Pi Mu both maintained their leadership roles



Dr. John Imhoff



in national ratings, and the faculty members were active in various professional societies. Professor Imhoff was president of Alpha Pi Mu, which hosted the national Alpha Pi Mu conference here in 1966. The meetings, attended by outstanding students from chapters around the country, featured talks by Dr. Lillian Gilbreth, the acknowledged "mother of IE."

The outstanding faculty assembled during the latter part of the 60s set the stage for very rapid growth and achievement. The MSOR degree was designed to add an IE overlay to science graduates in mathematics, chemistry, physics and other disciplines. Another important graduate program developed by the department during the 70s was the Operations Management program. Drs. Asfahl, Imhoff and Skeith designed this program and later, Dr. Asfahl became its administrator. The program has been one of the largest MS degree granting units at the University of Arkansas for many years.

In 1980 Dr. Bob Emerson took over the role of Department Head. The new facilities provided greatly needed state-of-the-art space for college laboratories and additional office space. Several faculty changes



Dr. Bob Emerson

occurred during the period. Dr. Emerson resigned in 1985 and William Rader was appointed interim head until Dr. Eric Malstrom, a Purdue University graduate, was hired in 1986-87. One of Dr. Malstrom's first priorities as the new department head was to establish rapport with the newly formed Arkansas Academy of Industrial Engineering.



Dr. Eric Malstrom

While the new Bell Engineering Building alleviated much of the perennial space shortage, the faculty shortage became a new challenge. In response to Dr. Malstrom's continued requests for additional support, several excellent faculty were added in the late 80s.

In 2000 the Industrial Engineering Department and community mourned the unexpected loss of Dr. Malstrom. After Dr. Malstrom's untimely death, the reins of the department were passed to Dr. John English. During his tenure, the



Dr. John English

department continued its growth with the undergraduate program more than doubling. The growth brought new challenges and most specifically, the focus was on retention. With the help of Dr. Richard Cassady, the new Freshman

Engineering Program (FEP) was developed so that all freshman engineering students would have a common first year experience. This helped sustain the growth over the next several years.

In 2007 Dr. English accepted a position at Kansas State University, serving as their dean of engineering. At that time, Dr. Ron Rardin was asked to step in as interim department head. The search was launched for a permanent department head and the result brought Dr. Kim LaScola Needy to the department. Dr. Needy's enthusiasm and passion for industrial engineering has helped the department to continue its excellence in



Dr. Ron Rardin



Dr. Kim LaScola Needy

engineering education and research, and to improve the national ranking of the program at the University of Arkansas. Through the development and implementation of a Strategic Plan and with Dr. Needy's leadership, the department looks forward to new and broadening horizons in the future.



Dr. Russell D. Meller

Center for Excellence in Logistics and Distribution

The Center for Excellence in Logistics and Distribution (CELDi) is a university-based enterprise with nine universities providing innovative solutions for logistics and distribution excellence with our member organizations. The research in CELDi focuses on bottom-line impact with our member organizations (i.e., how does one research team working with one member organization provide an innovative solution to the member organization that allows that member organization to achieve a higher level of excellence and the reduced costs, increased service, and/or higher quality associated with the solution).

The 2011 portfolio of CELDi projects resulted in training and jobs for students and innovative solutions for logistics and distribution excellence, with success stories that affected bottom-line performance.

Two of those success stories were announced in 2011. The first project was led by Dr. Tim Matis at Texas Tech University in conjunction with member organization Medical Center Health System (Odessa, TX), where the team improved the patient discharge process to increase hospital bed capacity. MCH attested to a "triple bottom-line impact: Cost savings of over \$250,000 per year, lower ER backlog, and increased customer satisfaction." The second 2011 CELDi success story project was led by Dr. Russell Meller at the University of Arkansas in conjunction with Medline Industries (Chicago, IL), where the team created a tool for distribution center optimization so as to reduce labor costs. Medline attested to "labor savings of \$750,000 per year due to the significant drop (>10%) in travel time per line after implementation

of the CELDi warehouse tool."

But what is exciting about being part of a large research center is the synergy that can be created through collaborating organizations when they work on joint projects or through researchers learning from each other. To effectively increase collaboration in the center, we realized that a primary task of CELDi is to manage the knowledge that is created in CELDi. This realization led the CELDi industrial advisory board (IAB) to fund a project called "the CELDi Knowledge Management Tool" (or CELDi KM Tool). The project is being led by Dr. Tim Matis at Texas Tech University.

The CELDi KM Tool will pull together the knowledge created from over 200 projects completed in CELDi. The CELDi KM Tool will do this through a database that can be accessed by a computer or smart phone application. The goal

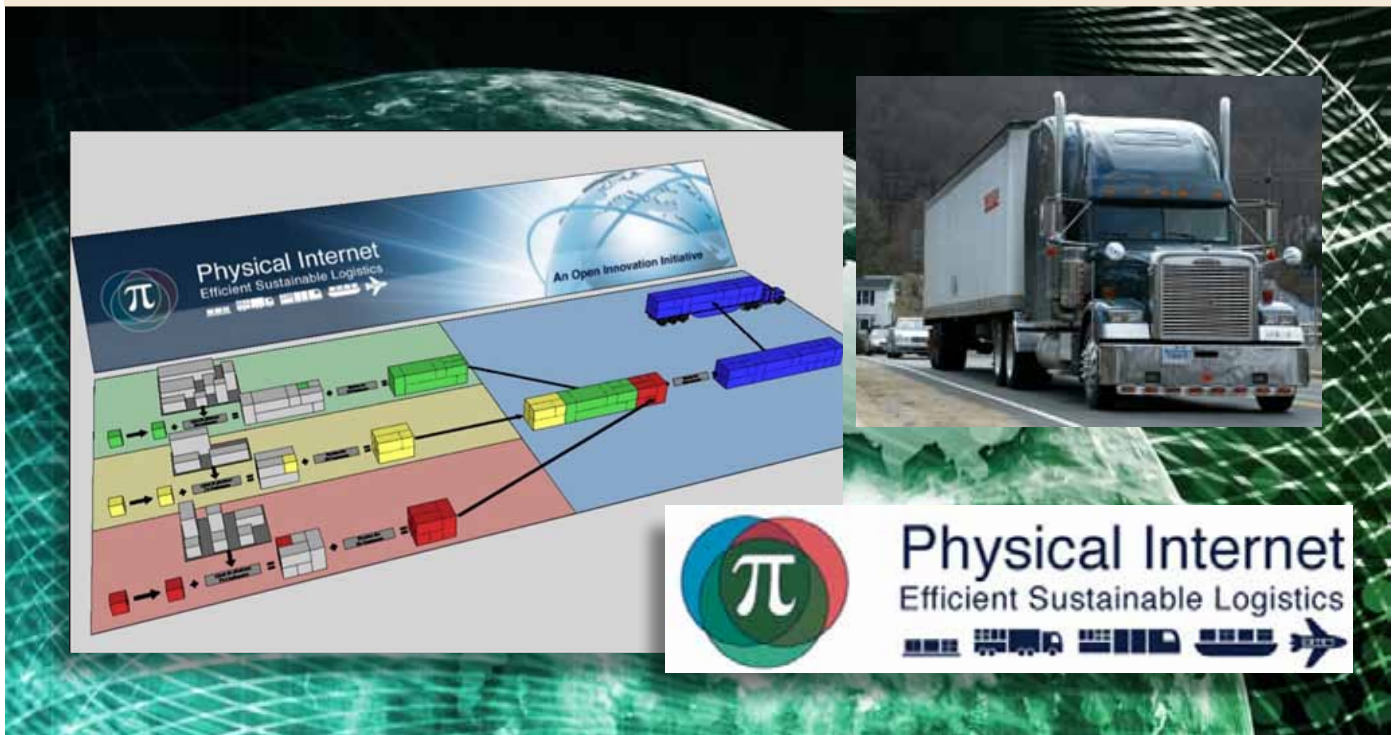
is that this database will provide for increased collaboration in the Center as it moves forward.

And speaking of moving forward, the funding renewal effort for CELDi, which started in 2011, was recently approved at the U.S. National Science Foundation. CELDi is one of the first centers to be funded in a new phase-III program that will extend CELDi's

NSF funding through 2017. And although 2017 sounds like a long time in the future, CELDi will begin working on a revision to the CELDi strategic plan that will ensure the long-term sustainability of the Center.

Another aspect of long-term sustainability is renewing the university partnership base of CELDi. We are fortunate to have

three universities (Texas A&M, N.C. State University, and Wayne State University) actively engaged in gaining approval for a CELDi site and four current sites that are working through their own renewal process at NSF. We are confident that CELDi will continue to grow during our next phase. New member organizations and universities are always welcome.



CELDi Physical Internet Project

Question: When you are driving down the road, on average, how full is that semi-truck trailer in front of you?

Answer: Less than half full.

Impossible you say? Not according to the latest government statistics that show that 25% of the time trailers are completely empty and when "full," trailers only are about 60-70% full.

Question: So, what's the impact of this?

Answer: The products you buy are more expensive than they could be. The distribution of products has a higher carbon footprint than is necessary. The roads are more congested than they need to be. And the quality of life for truck drivers is lower than it could be.

Our claim is that the current freight logistics system is not economically, environmentally, or

socially sustainable and the grand challenge for those of us who work in the area of logistics is how to design a system that meets this challenge. A vision for a new logistics system has been called the Physical Internet (PI), where the PI is an open global logistics system founded on physical, digital and operational interconnectivity through encapsulation, interfaces and protocols. The PI enables an efficient and sustainable logistics web that is

both adaptable and resilient.

The CELDi PI project is a funded collaboration (\$300k) between two universities (Arkansas and Virginia Tech), seventeen organizations that span retailers, consumer-packaged goods companies, diversified manufacturers, transportation service providers, logistics software and support companies, professional associations, and the National Science Foundation. The goal of the project is to establish the impact of the PI on the economic, environmental and social sustainability of our logistics system.

The project has focused on

developing optimization models to size the modular containers that would be used in the PI and to solve network routing problems that would result from a collaborative freight distribution network. All along the way, data from the industry partners have been used, which allows the results of the project to be stated in real-world terms. The final phase of the CELDi PI project will use the modeling results to build possible business models for the main system stakeholders.

This project has also led to collaboration between fifteen European organizations on a multi-

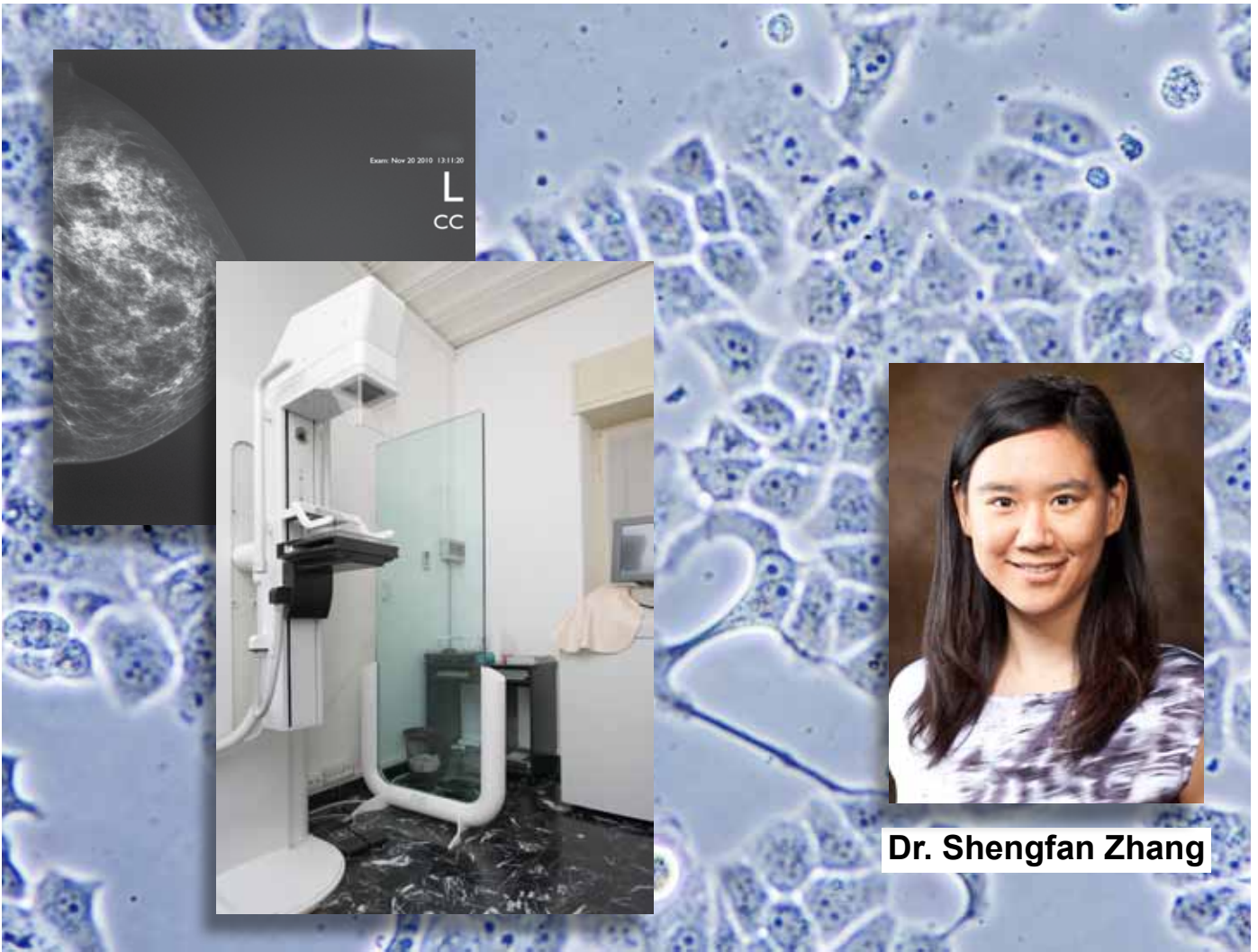
million-euro European Commission research project that will combine the optimization models on container sizing from this project and the mechanical prototyping capabilities at the Graz University of Technology (Austria) to produce modular containers that P&G and the Italian Post will use in their European supply chains by 2015.

If you would like to join this CELDi PI project and help support the effort, please contact Dr. Russell D. Meller (rmeller@uark.edu).

<http://faculty.ineg.uark.edu/rmeller/web/CELDi-PI/index-PI.html>



The Senior Walk is the University of Arkansas' longest tradition in miles as well as years.



Dr. Shengfan Zhang

Breast Cancer Research

Using Industrial Engineering tools, Dr. Shengfan Zhang's primary research goal is to develop new methodologies to help individuals make better decisions regarding health and wellness. In particular, her main focus is breast cancer prevention and treatment. Most of the current guidelines for population-based mammography screening program are for the average woman, and only consider age as the sole factor in determining the starting time and frequency of screening. However, breast cancer does not develop in the same way for everyone. Dr. Zhang's research will fill this gap by developing personalized and cost-effective policies on routine screening, biopsy procedures, and cancer treatment.

One of the current projects of Dr. Zhang's research group is to examine the impact of breast cancer spontaneous regression. While many medical studies

have suggested breast cancer may regress without treatment, there have been limited analytical studies on this topic. Women's biopsy and treatment decisions may be affected by the way how cancer grows. Along with age, more information is included to facilitate personalized decision-making, including race, family history of breast cancer, personal health status, mammograms history, and other breast cancer risk factors. In addition to demographic characteristics, Dr. Zhang's research group is also working on incorporating the effect of behavioral and cognitive factors into decision modeling, e.g., adherence to screening. Collaborating with experts in the medical and public health community, Dr. Zhang and her research group strive to identify and develop more personalized and cost-effective strategies for breast cancer screening and treatments, benefiting women with a variety of backgrounds and characteristics.



Dr. Heather Nachtmann

Mack-Blackwell Rural Transportation Center

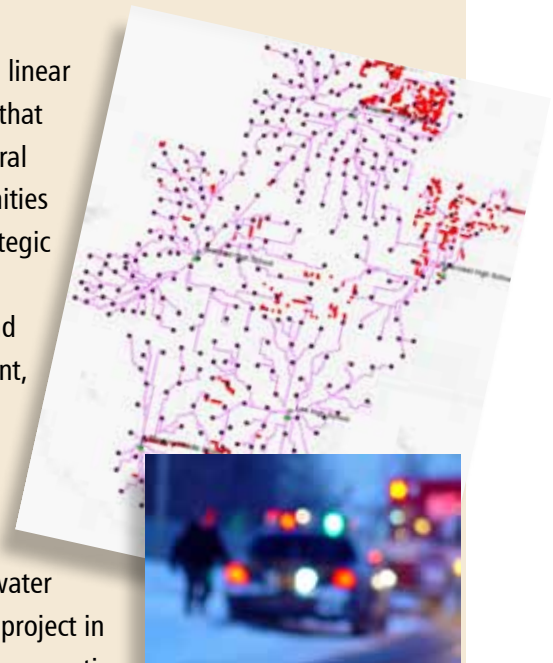
The Mack-Blackwell Rural Transportation Center (MBTC) operates as a U.S. Department of Transportation University Transportation Center and an institution of the National Transportation Security Center of Excellence (NTSCOE) of the U.S. Department of Homeland Security. With an annual research budget of approximately \$1.8 million, MBTC works closely with the Arkansas State Highway and Transportation Department and many other transportation stakeholders across the nation. MBTC researchers provide multidisciplinary expertise in engineering, business, and social science to lead nationally relevant multimodal research efforts. Additional information about MBTC's research, education and technology transfer programs can be found at www.mackblackwell.org. MBTC is directed by Dr. Heather Nachtmann, Associate Professor of Industrial Engineering.

Industrial engineering faculty played a major role in MBTC's research program this year. Dr. Chase Rainwater and Dr. Ashlea Milburn completed a project representing the first steps in a passenger rail feasibility study for Northwest Arkansas, while providing new mathematical modeling and solution methodology contributions to the area of transportation research. Their integrated

model exploits the linear network structure that best suits many rural American communities and considers strategic decisions such as station location and vehicle procurement, as well as tactical issues that include vehicle scheduling. Drs.

Milburn and Rainwater also began a new project in 2011 that focuses on creating disaster relief planning models that can be used both pre- and post-disaster to specify locations for shelters and routing plans for relief supplies.

This year, Dr. Steve Johnson developed, administered and analyzed a survey that provided reliable, valid and useful information as to the reasons to choose or not choose to be an independent contractor. In addition to addressing the perceived advantages and disadvantages



of being an independent contractor, the survey investigated the methods that independent contractors use to capitalize on the benefits and accomplish the specific responsibilities associated with being independent. A combination of face-to-face interviews (at 19 truck stops from California to Connecticut) and an interactive, web-based survey accessible by drivers were used to administer the survey. Thirteen different organizations (including trucking companies and trade organizations) provided telephone and email contact information for participants.

Dr. Edward Pohl, along with Dr. Chase Rainwater, conducted a mathematical modeling effort to mitigate against the worst case disruption scenario where system performance is measured as the maximum distance from a demand point to its closest facility after failures. Their models can allow for tradeoffs between multiple objectives as well as generate other managerial insights. They present a case study that examines vulnerabilities in the rail infrastructure used to transport coal in the United States.

Dr. Heather Nachtmann led three research projects related to inland waterway transportation. She and Dr. Edward Pohl completed a project that provides a methodology to quantify the potential of communities to benefit from inland waterway emergency response through the development of a Waterway Emergency Services index and provides decision support to help emergency planners design an effective and efficient

inland waterway-based emergency response system that will enhance their county-level emergency operations plans. Their resulting methodology is implemented on a case study of a four state region along the lower Mississippi river region. Dr. Nachtmann and Dr. Letitia Pohl completed a project that explores the feasibility



of renewable energy usage within the nation's inland waterway system and identified the most critical system components with potential renewable energy applications. This year Dr. Nachtmann began a new project that supports Arkansas' inland waterway transportation system by providing current economic information regarding the impacts of normal operations and potential disruptions on the Arkansas economy.



The Chi Omega Greek Theatre was completed in the summer of 1930. In 1992, it was listed on the National Register of Historic Places.



Dr. Ronald L. Rardin

Center for Innovation in Healthcare Logistics

The Center for Innovation in Healthcare Logistics (CIHL) is an industry-university partnership that leads a nationwide effort to identify and foster system-wide adoption of ground-breaking healthcare supply chain and logistic innovations. CIHL takes a leading role in setting and pursuing healthcare supply chain innovation through a collaboration with healthcare professionals and their industrial organizations, joining with Center team in intensive but objective engineering analysis of supply chain challenges with system-wide reach. The Center has been led in 2011 by Dr. Ronald Rardin, Director, and Drs. Edward Pohl and Heather Nachtmann, Co-Deputy-Directors. During the year, it has involved 5-6 Industrial Engineering faculty, 2 postdoctoral fellows, 6-8 graduate assistants, and 2 central staff.

CIHL has been industry funded at \$600K+ annually since its launch in 2007, with major sustaining support from Wal-Mart, Blue Cross Blue Shield, and the VHA Inc. Hospitals. Other collaborators have provided further resources, expertise and test sites. They have included AHRMM (Association for Healthcare Resource & Materials Management), SMI (Strategic Marketplace Initiative), GS1 Healthcare US, HISCI (Healthcare

Industry Supply Chain Institute), HIDA (Healthcare Industry Distributors Association), HSCA (Healthcare Supply Chain Association), and a variety of collaborating hospital partners including Washington Regional Medical Center in Fayetteville AR, CoxHealth in Springfield MO, Beth Israel Deaconess Medical Center in Boston MA, Denver Health in Denver CO, Longmont United Hospital in Longmont CO, USC Medical Center in Los Angeles CA and FMOL in Baton Rouge, LA. Four major projects were underway in 2011.

Provider Adoption of GS1 Standards for Product and Location Identification

Drs. Ronald Rardin PI and Nebil Buyurgan Co-PI. The largest CIHL venture and most representative of Center's vision seeks to foster widespread healthcare industry adoption of GS1 global data standards for product and location identifiers (like those long used in retail and elsewhere). Provider hospitals are the largest group of potential adopters, but have the least in-house technical resources. The Center is helping providers to confront the GS1 implementation challenge and understand associated barriers and opportunities. CIHL pilot testing

and intensive interactions with opinion leaders have contributed several keys to understanding issues.

The biggest roadblock is documenting a business case to implement. A major CIHL achievement has been to develop an Excel-based Levels, Readiness and Impacts Model (LRIM) for potential provider adoption paths. LRIM enumerates required provider investments for different paths, and quantifies in detail the process impacts that can be expected. In 2011, LRIM was tested at five hospital sites across the nation. Then in November a version of the code was released free online. To date, over 140 healthcare organizations have downloaded the model.

Identifying Opportunities for Cost & Quality Improvements in Healthcare Logistics

Drs. Heather Nachtmann PI and Edward Pohl Co-PI. The biggest barrier to buy-in on healthcare supply chain innovations by C-suite leaders of suppliers, distributors and providers has been the lack of any reliable, objective evaluations of what opportunities promise the greatest cost savings and quality improvement. The result has been to leave supply chain improvement efforts under-noticed, under-funded, and under-sustained. CIHL's Cost and Quality project has conducted (in collaboration with AHRMM, HISCI, HIDA and HSCA) several rigorous, high-level surveys designed to illuminate the opportunities available in the current environment. The most important of these, documented in the widely distributed 2009 report *The State of Healthcare Logistics*, enumerated shortfalls recognized by responding healthcare professionals and focused attention on those with greatest promise for widespread impact. Later surveys addressed rates and impacts of GS1 data standards adoption in various parts of the industry.

Retail vs. Healthcare Supply Chain Gaps

Drs. Edward Pohl, PI, Manuel Rossetti, and Heather Nachtmann, Co-PIs. It is natural to believe that the more standardized, automated, and scientific supply chain practices used in retail and other industries should have much to offer to less mature healthcare materials management systems. Still, few of these "gap" opportunities have been seriously investigated. In concert with SMI, CIHL is conducting an in-depth investigation to identify which technology transfers can most benefit healthcare logistics, and to understand unique healthcare issues that may prevent adoption

of others. Working with an advisory committee of industry experts and some survey results, the Gap team has focused the investigation on (i) enhanced training for materials management personnel, (ii) actual usage inventory management, and (iii) collaborative planning, forecasting and replenishment within healthcare supply chains. An actual usage case white paper was published in 2011 reporting significant advances in a pilot application from the implementation of advanced scientific inventory management techniques.

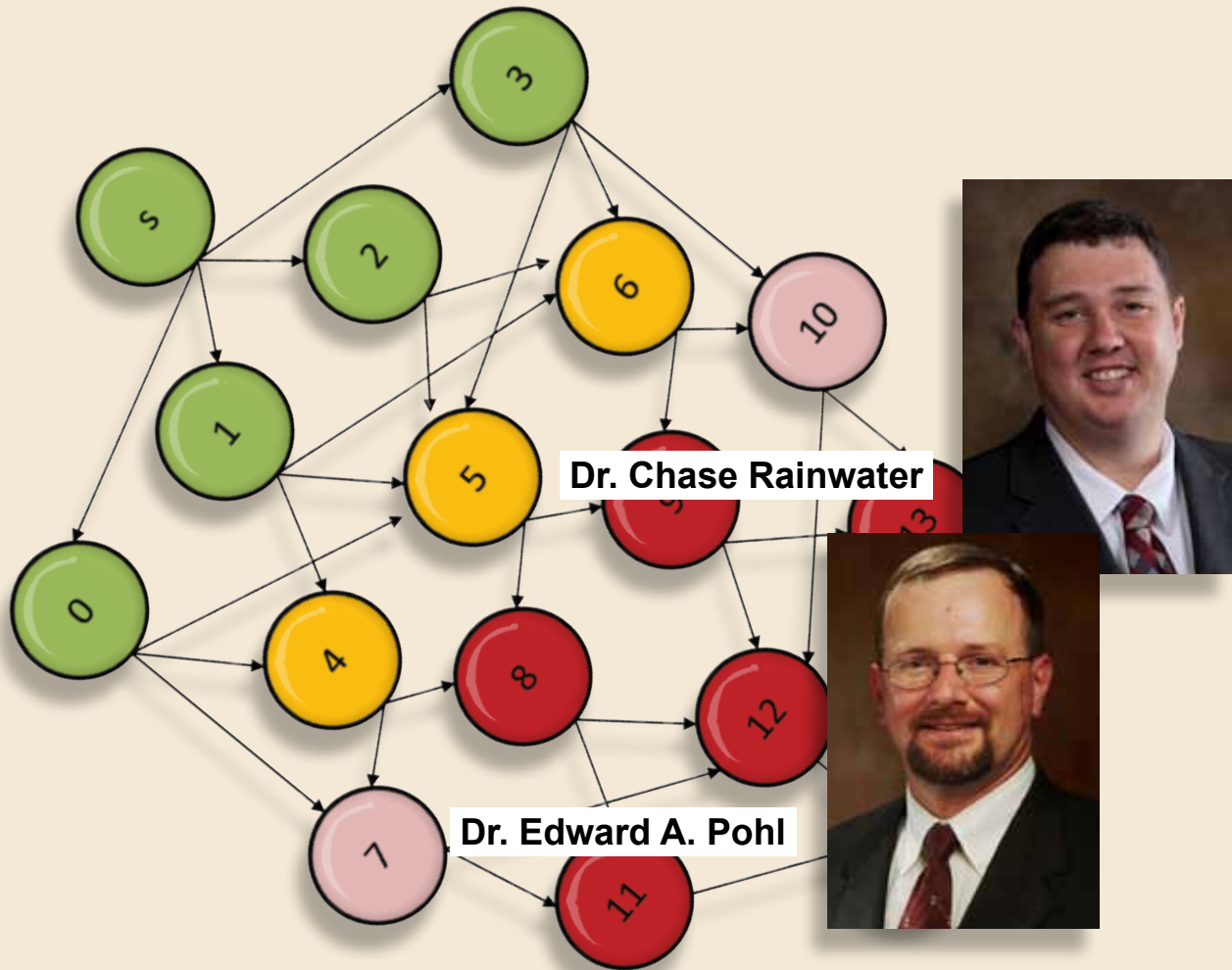
Supply Chains for Home Healthcare

Drs. Ashlea Bennett Milburn, PI, and Scott Mason (Clemson) Co-PI. Healthcare delivery is "going home" with aging populations, epidemic chronic diseases, escalating costs of in-hospital care, and diminishing access in rural areas. This project is exploring supply chain aspects of home health, focusing on costs and best practices. With the help of industrial organizations, the project team has conducted surveys of a broad sample of current providers. Results are now leading to isolation of best practices and a focus on more efficient utilization of resources (e.g. nurses, supplies, and transportation).

Health Systems Engineering Alliance (HSEA)

While a few pioneering health systems engineering (HSE) programs in academia have focused for decades on engineering health prevention and treatment processes and operations, it is only in recent years that there has been an explosion of healthcare delivery research activities and education programs across academic units specializing in industrial, systems and related branches of engineering.

To encourage sharing and collaboration among the growing number of HSE academic programs on what research is needed, what courses/certificates/degrees should/are being offered, and how synergy can be achieved, the University of Arkansas has taken the lead in organizing a new Health Systems Engineering Alliance. Foundational ideas emerged from a 2010 NSF-co-sponsored workshop of HSE program leaders organized by IE faculty Drs. Ronald Rardin, Nebil Buyurgan, Ed Pohl, and Ashlea Bennett Milburn. A variety of follow on meetings and activities followed in 2011 under Arkansas leadership, and faculty from over 40 academic programs have now committed to participate in the emerging HSEA.



Reliability Analysis in Social Networks

Drs. Rainwater and Pohl, in collaboration with Dr. Jose Ramirez-Marquez from Stevens Institute, are utilizing operations research techniques to better understand how information is transferred within human organizations modeled as social networks. Social networks have long been used to model the interactions between people in various social and professional contexts, and the United States military has become increasingly interested in the use of Social Network Analysis to model and study clandestine organizations. To that end, operations researchers are interested in the use of quantitative methods to identify the most critical actors within an organization for the purpose of either influencing members within or disturbing the day-to-day operations of the organization to reduce the risk of terrorist attacks.

Drs. Rainwater and Pohl's research team have advanced this area of research by incorporating a reliability-based

network framework to assess the effectiveness of human organizations. This framework mathematically represents human interaction scenarios in which actors exhibit a certain amount of influence with a given probability. Since no formal method for identifying influence levels and/or their associated probability distributions exists, they have proposed a method for eliciting influence probabilities within a college classroom environment that provides a baseline for quantifying social behaviors. Specifically, the levels of influence possessed by instructors and teaching assistants are probabilistically assessed.

This information is used to determine how educational content is best transferred to students both in and out of the classroom. Their work shows that the use of reliability importance measures for a multi-state social network can lead to the identification of different critical members than those identified by traditional social network analysis.



Renewable Energy

When the renewable energy course was presented in the spring 2009, the history and present status of wind, tidal, solar and biofuels were reviewed with undergraduate and graduate students. A renewable energy laboratory was established and a one day photovoltaic array seminar, open to the general community and students, was developed for the laboratory. The course continued to be popular with the students, but limited to the number of seats available in the classroom. The lectures were captured in live stream video and the course was offered to the off-campus MS Engineering graduate students. The enrollment by students across the country greatly increased with the introduction of the course. On campus students can now enroll in the fall and spring semesters, thus eliminating the class size as a limitation.

The one day photovoltaic seminar has been presented two to four times per year based upon requests from

the community. Three and soon four participants in the seminar have built their own PV arrays for their residences and are successfully net metering with investor owned and electrical cooperatives. One of the arrays, located on a family farm, is being used to educate elementary school children on how modern farms operate.

The objective is to keep the course lectures current. Literature research is made constantly to identify updates of the advancement of successful implementation of renewable energy sources. Governmental policies, transmission/logistics and economics of scale have caused some approaches to energy capture to advance and some approaches to be discarded. New services to maintain and manage large industrial/commercial projects have been developed. Many research projects started in the early 2000s have been evaluated and full scale installation completed and awaiting expansion.

Publications

In 2011 the faculty of the Department of Industrial Engineering at the University of Arkansas contributed ten book chapters, 22 refereed journal articles, 30 other refereed publications and proceedings, 28 unrefereed publications and proceedings and offered 53 invited lectures and oral presentations. The faculty contributors are indicated in bold text.

Chapters in Textbooks and Handbooks

Buyurgan, N., B. C. Hardgrave, "RFID in Healthcare Industry." *Emerging Pervasive and Ubiquitous Aspects of Information Systems: Cross-Disciplinary Advancements*, Judith Symonds, Editor, IGI-Global Publishing, 2011.

Rossetti, M. D., **N. Buyurgan**, and **E. A. Pohl**, "Medical Supply Logistics." *Handbook of Healthcare System Scheduling*, Randolph Hall, Editor, Springer, 2011.

Buyurgan, N., S. Landry, and R. Philippe, "RFID Adoption in Healthcare and ROI Analysis." *RFID Applications*, Alp Ustundag, Editor, Springer, 2011.

Ertem, A., **N. Buyurgan**, "Auction Design for Procurement Operations in Humanitarian Logistics." *Humanitarian and Relief Logistics: Research Issues, Case Studies and Future Trends*, V. Zeimpekis, S. Ichoua, I. Minis, Editors, Springer, Accepted 2011.

Milburn, A. B., "Operations research applications in home healthcare." *Handbook of Healthcare System Scheduling*, New York, R. Hall, Editor, 281-303, Springer, Accepted 2011.

Rossetti, M. D., **N. Buyurgan**, and **E. A. Pohl**, "Chapter 10: Medical Supply Chain Logistics." *The Handbook of Healthcare System Scheduling: Delivering Care When and Where We Need It*, R. Hall, Editor, Springer, Accepted 2011.

Pohl, E. A., "Chapter 8, Reliability Engineering." *Decision Making in Systems Engineering and Management*, G. Parnell, P. Driscoll, D. Henderson, Editors, 227-271, John Wiley & Sons, 2011.

Pohl, E. A., **H. Nachtmann**, "Chapter 5, Life Cycle Costing." *Decision Making in Systems Engineering and Management*, G. Parnell, P. Driscoll, D. Henderson, Editors, 137-182, John Wiley & Sons, 2011.

Hill, R. R., **E. A. Pohl**, "Heuristics and Their Use in Military Modeling." *Encyclopedia of Operations Research and Management Science*, J. Cochran, Editor, John Wiley & Sons, 2011.

Scala, N., J. Rajgopal and **K. L. Needy**, "An inventory criticality classification method for nuclear spare parts: A case study." *Decision Making Under Uncertainty in the Service Industry*, J. Faulin, A. Juan, S. Grasman & M. Fry, Editors, CRC/Taylor & Francis, Accepted 2011.

Refereed Journal Articles

Buyurgan N., **R. Rardin**, R. Jayaraman, V. M. Varghese, and A. Burbano, "A Novel GS1 Data Standard Adoption Roadmap for Healthcare Providers." *International Journal of Healthcare Information Systems and Informatics*, Vol. 6 No. 4 (2011): 41-58

Ertem, M. A., **N. Buyurgan**, "An Auction-Based Framework for Procurement Operations in Disaster Relief." *Journal of Humanitarian Logistics and Supply Chain Management*, Vol. 1 No. 2 (2011): 170-188

Tovia, F., R. M. Brooks, **C. R. Cassady** and **M.D. Rossetti**, "Modeling and Analysis of Service Parts Logistics Systems." *The International Journal of Operations Research*, Vol. 10 (2011): 60-81

Townsley, J., **J. R. Chimka**, "A control chart for severity index to detect drought compares favorably to logistic regression." *Hydrology Research*, Vol. 42 No. 1 (2011): 1-9

Chimka, J. R., Q. Hong and L. Jetty, "A diversity monitor with known errors for process variability observed in categorical data." *International Journal of Performability Engineering*, Vol. 7 No. 4 (2011): 397-399

Chimka, J. R., J. Wu and Q. Hong, "On quality control standards to evaluate microarray studies." *International Journal of Quality Engineering and Technology*, Vol. 2 No. 1 (2011): 45-53

Black, R., **J. R. Chimka**, "Re-estimating and remodeling general aviation activities." *International Journal of Applied Aviation Studies*, Vol. 11 No. 1 (2011): 47-56

Li, Y., **C. S. Nam**, B. Shadden, and **S.L. Johnson**, "A P300-Based Brain-Computer Interface: Effects of Interface Type and Screen Size." *International Journal of Human-Computer Interaction*, Vol. 27 (2011): 52-68

Pazour, J. A., **R. D. Meller**, "An Analytical Model for A-Frame System Design." *IIE Transactions on Design & Manufacturing*, Vol. 43 (2011): 739-752

Pohl, L. M., **R. D. Meller**, and K. R. Gue, "Turnover-Based Storage in New Unit-Load Warehouse Designs." *IIE Transactions on Design & Manufacturing*, Vol. 43 (2011): 703-720

Bennett, A. R., A. E. Erera, "Dynamic periodic fixed appointment scheduling for home health." *IIE Transactions on Healthcare Systems Engineering*, Vol. 1 (2011): 6-19

Blank, L., P. Borrowman, H. Carrasco, **H. Nachtmann**, and **J. White**, "Inclusion of Engineering Economy Concepts and Techniques in B.S. Engineering Curricula." *The Engineering Economist*, Vol. 56 (2011): 193-204

Smith, B. K., **H. Nachtmann**, and **E. A. Pohl**, "Quality Measurement in the Healthcare Supply Chain." *Quality Management Journal*, Vol. 18, No. 4 (2011): 50-60

Nachtmann, H., E. A. Pohl, "The Inland Waterway Transportation Systems' Role in Response and Recovery." *Journal of Homeland Security*, online (2011)

Farrokhvar, L., **H. Nachtmann**, and **E. A. Pohl**, "Catastrophes and Complex Systems: Transportation - "The Inland Waterway Transportation Systems' Role in Response and Recovery." *Journal of Homeland Security*, online (2011)

Burbano, A., **R. Rardin**, and **E. A. Pohl**, "Models for reducing the Risk of Critical Networked Infrastructures." *International Journal of Risk Assessment and Management*, Vol. 15, Nos. 2/3 (2011): 99-127

Saka, B., **R. Rardin**, M. Langer, and D. Dink, "Adaptive intensity modulated radiation therapy planning optimization with changing tumor geometry and fraction size limits." *IIE Transactions on Healthcare Systems Engineering*, Vol. 1 (2011): 247-263

Dink, D., **R. Rardin**, M. Langer, B. Saka, S. Gumrukcu, J. Pekney, and G. Reklaitis, "IMRT Optimization with Both Fraction and Cumulative Constraints." *American Journal of Operations Research*, Vol. 1 (2011): 160-171

Qu, X., **R. Rardin**, and J. Williams, "Single versus hybrid time horizons for open access scheduling." *Computers and Industrial Engineering*, Vol. 60 (2011): 56-65

Tuncel, A., **R. Rardin**, M. Langer, and J.P. Richard, "Strong Valid Inequalities for Fluence Map Optimization under Dose-Volume Restrictions." *Annals of Operations Research*, (2011)

Rossetti, M. D., Y. Unlu, "Evaluating the robustness of lead time demand models." *International Journal of Production Economics*, Vol. 134 (2011): 159-176

Rossetti, M. D., A. Achlerkar, "Evaluation of Segmentation Techniques for Inventory Management in Large Scale Multi-Item Inventory Systems." *International Journal of Logistics Systems Management*, Vol. 8 (2011): 403-424

Refereed Conference Proceedings and other Refereed Publications

Lehlou N., **R. Rardin, N. Buyurgan**, R. Jayaraman, V. M. Varghese, A. Burbano, A. Hajiyev, E. Rashidi, and P. Farrokhvar, "A Levels, Readiness, and Impact Evaluation Model for GS1 Adoption in Healthcare." *Proceedings of the 2011 Industrial Engineering Research Conference (IERC)*, Reno NV, May 2011

Jayaraman, R., **R. Rardin, N. Buyurgan**, V. M. Varghese, A. Burbano, J. Pazour, N. Lehlou, A. Hajiyev, and D. Dixon, "Data Standards in Healthcare Supply Chain Operations." *Proceedings of the 2011 Industrial Engineering Research Conference (IERC)*, Reno NV, May 2011

Rardin, R., N. Buyurgan, E. A. Pohl, and **A. R. Bennett**, "Healthcare Systems Engineering Research and Education Leadership Workshop." *Proceedings of the NSF Engineering*

Research and Innovation Conference, Atlanta GA, January 2011

Cassady, C.R., "An Introduction to Probabilistic Methods in Reliability and Maintainability." *Proceedings of the International Reliability and Maintainability Symposium (RAMS)*, Orlando, FL, January 2011

Schluterman, H.A., K. Schneider and **C.R. Cassady**, "Evaluating Retention of Engineering Problem Solving Skills of First-Year Engineering Students." *Proceedings of the American Society for Engineering Education - Midwest Section Conference*, Russellville, AR, September 2011

Klingbeil, N.K., S.C. Molitor, B.W. Randolph, R.G. Brown, S.A. Olsen and **C.R. Cassady**, "The Wright State Model for Engineering Mathematics Education: Highlights from a CCLI Phase 3 Initiative." *Proceedings of the American Society for Engineering Education Annual Conference*, Vancouver, Canada, June 2011

Meller, R. D., K. P. Ellis, "An Investigation into the Physical Internet: Establishing the Logistics System Gain Potential." *Proceedings of the 2011 International Conference on Industrial Engineering and Systems Management*, Metz (France), May 2011

Pazour, J. A., **R. D. Meller**, "Applying a Throughput Stability-Condition Model to a Picking Machine." *Proceedings of the 2011 Industrial Engineering Research Conference (IERC)*, Reno NV, May 2011

Thompson, B., **A. R. Bennett**, "Reducing length of stay for congestive heart failure patients." *Proceedings of the American Society for Engineering Management Conference (ASEM)*, Lubbock, TX, October 2011

Evans, E., **H. Nachtmann**, and **K. L. Needy**, "A Look into the Engineering Economy Classroom." *Proceedings of the American Society for Engineering Education Annual Conference*, Vancouver, BC, June 2011

Tong, J., **H. Nachtmann**, "A Review of Risk Assessment Models for Inland Waterway Transportation." *Proceedings of the 2011 Industrial Engineering Research Conference (IERC)*, Reno NV, May 2011

Smith, B. K., **H. Nachtmann**, and **E. A. Pohl**, "An Investigation of the Healthcare Supply Chain: Literature Review." *Proceedings of the 2011 Industrial Engineering Research Conference (IERC)*, Reno NV, May 2011

Farrokhvar, L., **H. Nachtmann**, "Measuring the Feasibility of Inland Waterway Emergency Response." *Proceedings of the 2011 Industrial Engineering Research Conference (IERC0)*, Reno NV, May 2011

McReynolds, A., M. K. Cashion, and **K. L. Needy**, "LEED certification of public libraries – A comprehensive analysis." *Proceedings of the American Society for Engineering Management Conference (ASEM)*, Lubbock, TX, October 2011

McReynolds, A., M. K. Cashion, and **K. L. Needy**, "How U.S. public libraries pursue LEED certification: An empirical study." *Proceedings of the 2011 Industrial Engineering Research Conference (IERC)*, Reno NV, May 2011

Elizandro, D., S. Elkins, **K. L. Needy** and B. Malone, "An information system for evaluating the effectiveness of STEM-based programs." *Proceedings of the 2011 Industrial Engineering Research Conference (IERC)*, Reno NV, May 2011

Yeung, T., **E. A. Pohl**, "An Introduction to Optimization methods in Reliability and Maintainability." *Tutorial notes of the 57th Reliability and Maintainability Symposium*, Orlando, FL, January 2011

Sharp, S., **E. A. Pohl**, "Effect of Shelf Life on Perishable Goods Supply Chain Cost." *Proceedings of the 2011 Industrial Engineering Research Conference (IERC)*, Reno NV, May 2011

Pohl, E. A., C.R. Cassady, "Optimization in Reliability and Maintainability." *Tutorial Notes in the Proceedings of the Applied Reliability Symposium*, San Diego, CA, June 2011

Hall, K., D. Xiao, **E. A. Pohl** and K. Wang, "Risk Analysis of Mechanistic-Empirical Pavement Design Methods." *Proceedings of the International Conference on Transportation Engineering*, Chengdu, China, July 2011

♦ Schneider, K., **C. Rainwater** and **E. A. Pohl**, "Assessing Multi-Layered Social Networks Using Reliability Models." *Proceedings of the International Reliability and Maintainability Symposium (RAMS)*, Orlando, FL, January 2011

Schneider, K., **C. Rainwater** and **E. A. Pohl**, "Investigating actor Importance in a Multi-State Social Network." *Proceedings of the 2011 Industrial Engineering Research Conference (IERC)*, Reno NV, May 2011

Burbano, A., **R. Rardin**, and **E. A. Pohl**, "Exploring the Factors Affecting the Identification Standards Adoption Process in the US Healthcare Supply Chain." *Proceedings of the 2011 PICMET Conference*, Portland, OR, July 2011

Burbano, A., **R. Rardin** and **E. A. Pohl**, "Modeling Adoption of Identification Standards in U.S. Hospitals: A Systems Dynamics Approach." *Proceedings of the 2011 Industrial Engineering Research Conference (IERC)*, Reno NV, May 2011

Rardin, R., B. Saka, and M. Langer, "Adaptive intensity modulated radiation therapy planning optimization with changing tumor geometry and fraction size limits." *NSF Engineering Research and Innovation Conference*, Atlanta GA, January 2011

Varghese, V. M., **M. D. Rossetti**, "Comparing Intermittent Demand Forecasters and Effects of Temporal Demand Aggregation." *Proceedings of the 2011 Industrial Engineering Research Conference (IERC)*, Reno NV, May 2011

Unlu, Y., **M. D. Rossetti**, "Evaluating Variance Reduction Techniques Within A Sample Average Approximation Method For A Constrained Inventory Policy Optimization Problem." *Proceedings of the Winter Simulation Conference*, Phoenix, AZ, December 2011

Unlu, Y., **M. D. Rossetti**, "Zero-Modified Distributions for Inventory Control under Intermittent Demand." *Proceedings of the 2011 Industrial Engineering Research Conference (IERC)*, Reno NV, May 2011

Zhang, S., F. E. Payton and J. S. Ivy, "Understanding the Role of Mental Disorders on HIV Patient Outcomes." *Proceedings of the 6th INFORMS Workshop on Data Mining and Health Informatics*, Charlotte, NC, November 2011

♦ Best paper award



Photo courtesy of Carrie Pennington

Historic Engineering Hall, built in 1927.

Grants

During 2011, the following research grants were active. Project PIs are indicated in bold face type.

Fant, Earnest and Nebil Buyurgan, Red River Army Depot/ CELDi, \$50,000, "Robotic Vehicle Sanding Work Cell Development," 2010-2011

Gattis, Carol, Shannon Davis, James Hesteskin, Todd Shields and Richard Cassady, National Science Foundation, \$599,988, "Breaking Barriers: Pathways to Graduation for Underrepresented Talent," 2008-2013

Gattis, J.L. and **Steve Johnson**, Arkansas State Police, \$128,501, "Seat Belt, Motorcycle Helmet and Child Restraint Survey," 2011-2012

Johnson, Steve, University of Arkansas, \$19,627, "Relative Advantages and Disadvantages of Independent Contractor Status," 2011

Meller, Russell D., National Science Foundation, \$8,457, "International (Austria DDEP) Improving the Pharmaceutical Supply Chain," 2010-2011

Meller, Russell D., National Science Foundation, \$23,797, "Develop an Engineering Virtual Organization for Discrete-Event Logistics," 2007-2011

Meller, Russell D. and Kevin R. Gue, National Science Foundation, \$400,000, "Designing Distribution Centers for the Service Economy," 2006-2011

Meller, Russell D. and Kimberly P. Ellis, National Science Foundation, \$200,000, "Establishing the Logistics System Gain Potential of the Physical Internet," National Science Foundation, 2010-2012

Meller, Russell D., American Air Liquide, American Transportation Research Institute, The Boeing Company, Hewlett-Packard, JB Hunt, Leggett and Platt, Menasha Packaging Company, Material Handling Industry of America, The Procter & Gamble Company, Procter & Gamble Eurocor N.V., Volvo Logistics North America, Walgreens Company, Walmart, \$80,000, "Physical Internet Initiative," 2010-2012

Meller, Russell D., National Science Foundation, \$1,159,936, "CELDi Center Administration," 2002-2011

Meller, Russell D. and Montreuil, Benoit, Material Handling Industry of America, \$57,624, "Designing Material Handling Systems and Facilities for the Physical Internet," 2006-2011

Meller, Russell D., McGinnis, Leon F., Fowler, John W., Nazzal, Dima and Iken, Mark A., \$182,121, National Science Foundation, "Developing an Engineering Virtual Organization for Discrete-Event Logistics Systems," 2007-2011

Meller, Russell D., Medline/CELDi, \$50,000, "Inventory Policy Decisions and Warehousing Operational Costs," 2010-2011

Meller, Russell D., Medline/CELDi, \$50,000, "Analytical Performance Models of Pick Modules," 2011-2012

Milburn, Ashlea and Chase Rainwater, US Department of Transportation, \$27,595, "Model for Disaster Relief Shelter Location and Supply Routing," 2011-2012

Nachtmann, Heather and Kevin Hall, Arkansas State Highway & Transportation Department, \$50,000, "Mack-Blackwell Rural Transportation Center Distinguished Lecture Series," 2000-2011

Nachtmann, Heather and Kevin Hall, Department of Homeland Security, \$653,104, "Mack-Blackwell Transportation Center, University Transportation Center Administration," 2000-2012

Nachtmann, Heather, Kevin Hall, and Tish Pohl, Department of Homeland Security, \$554,846, "Mack-Blackwell Transportation Center National Transportation Security Center of Excellence Administration," 200-2013

Nachtmann, Heather and Letitia M. Pohl, U.S. Department of Homeland Security, Borders and Maritime Security Division, \$100,000, "Renewable Energy for Inland Waterways," 2009-2011

Nachtmann, Heather, U.S. Department of Transportation, Mack-Blackwell Rural Transportation Center, \$20,314, "Independent Graduate Student Support," 2009-2011

Nachtmann, Heather, US Department of Homeland Security, \$40,000, "Emergency Response Via Inland Waterways," 2010-2011

Nachtmann, Heather, Justin Chimka, Ed Pohl and Letitia M. Pohl, Department of Homeland Security, \$420,000, "Supporting Secure and Resilient Inland Waterways," 2010-2012

Nachtmann, Heather, US Department of Transportation, \$30,520, "Economic Evaluation of AR Inland Waterways and Potential Disruption Impact," 2011-2012

Nam, Chang and Tonya Smith-Jackson, National Science Foundation, \$570,028, "I FEEL SCIENCE: Innovative Flexible Experimental Environment for Learning in SCIENCE," 2007 – 2010

Nam, Chang and Tonya Smith-Jackson, National Science Foundation, \$99,750, "REU Supp: Research Experiences to Design for Inclusion," 2009-2011

Nam, Chang, National Science Foundation, \$499,983, "CAREER: We Feel Science: We Engage with the Flexible, Experimental Environment," 2010-2015

Pohl, Edward, Ashlea Milburn, Chase Rainwater and Scott Mason, Department of Homeland Security, \$170,000, "Mitigating Dynamic Risk in Multi-Modal Perishable Commodity Supply Chain," 2010-2012

Pohl, Edward and Justin Chimka, Learning Chameleon/ CELDi, \$45,000, "The Learning Chameleon," 2009-2011

Pohl, Edward, Scott Mason and Chase Rainwater, Department of Homeland Security, \$225,000, "Designing Resilient and Sustainable Supply Chain Networks," 2009-2011

Pohl, Edward and Richard Cassady, National Science Foundation/CELDi, \$60,000, "Research Experiences for Teachers," 2009-2010

Pohl, Edward, Ashlea Milburn, Chase Rainwater and Scott Mason, Department of Homeland Security, \$170,000, "Mitigating Dynamic Risk in Multi-Modal Perishable Commodity Supply Chain," 2010-2012

Rainwater, Chase and Ashlea Milburn, US Department of Transportation, \$43,983.82, "Rail Transportation Models For Rural Populations," 2010-2011

Rardin, Ronald, Ashlea Milburn, Nebil Buyurgan, Scott Mason, Heather Nachtmann, Edward Pohl and Manuel Rossetti, Corporate and Professional Sponsors of the Center for Innovation in Healthcare Logistics \$2,930,000, (All projects), 2007-2012

Rardin, Ronald, Ashlea Milburn, Nebil Buyurgan and Edward Pohl, National Science Foundation, \$34,056, "Workshop: Healthcare Systems Engineering Res & Ed Leadership Workshop," 2010-2011

Root, Sarah and Chase Rainwater, Arkansas Electric Cooperative Corp, \$45,000, "Coal Car Cooperative Feasibility Study," 2010-2012

Root, Sarah and Chase Rainwater, Arkansas Electric Cooperative Corp, \$56,000, "Design of a Coal Cooperative," 2011-2012

Root, Sarah, Scott Mason, Edward Pohl and National Science Foundation, \$72,837.00, "Collaborative Research.: Ensuring Continuity of Care: A Quantification of Risk in the Healthcare Supply Chain," 2009-2012

Root, Sarah and Russell Meller, Sam's Club/CELDi, \$66,500, "Modeling a Conversion of Suppliers from Prepaid to Collect (P2C) System," 2010-2011

Root, Sarah, Sam's Club/CELDi, \$55,000, "Sam's 2010-2011 Research Project," 2010-2011

Rossetti, Manuel, Invistics Corporation/CELDi, \$90,000, "Inventory Models for Intermittent Highly Variable Demand and Safety Stock Adjustments to Meet Desired Service Level Requirements," 2008-2011

Rossetti, Manuel, Invistics Corporation/CELDi, \$90,000, "Scorecards for Lean Inventory System," 2009-2011

Rossetti, Manuel, CELDi, \$53,334, "Supply Chain Network Simulator using Cloud Computing," 2010-2011



Undergraduate Program Overview



The goal of the Industrial Engineering Undergraduate Program at the University of Arkansas is to prepare men and women for professional careers and graduate studies in Industrial Engineering. We provide a foundation in mathematics, science, humanities and social sciences, engineering science, and engineering design to produce Industrial Engineers with the intellectual, technical, and professional competence to develop, implement, and manage industrial engineering solutions to complex problems in industry, government, and society.

Our program includes opportunities for study abroad, an optional cooperative work program, and an honors program for qualified students. The study abroad program is administered through the Office of Study Abroad and International Exchange. The John L. Imhoff Global Studies Endowment supports academic scholarships that help defray expenses incurred by industrial engineering students engaged in for-credit overseas study and/or an overseas work experience (internship or cooperative work program).

The aim of the University's cooperative education program is to provide interested students with opportunities to complement their engineering education with degree-related work experience. The work experience provides participants with opportunities to apply what they have learned in the classroom and to interact with experienced industrial engineers. Participants also gain insights into the industrial engineering profession that help them define their educational and career goals. In recent years, students from our department have participated in cooperative work experiences at ABF Freight System, Inc., Ayrshire Electronics, Black & Decker, Hawker-Beechcraft, Intel Corporation, J.B. Hunt Transport, Lockheed Martin, Pratt & Whitney, Rheem Manufacturing, and other major employers.

The Industrial Engineering Honors Experience is designed for industrial engineering students who are also enrolled in the University of Arkansas Honors College. The program gives honors students the opportunity to pursue unique coursework and research experiences.

The program requires a minimum of 12 hours of honors engineering courses, an undergraduate research experience and a written thesis.

Dr. Nebil Buyurgan serves as the Chair of Undergraduate Studies. More information on the undergraduate program can be found at: <http://www.ineg.uark.edu/1444.php>

In 2011, 200 students were enrolled in our undergraduate program. Enrollments continue to increase since the Freshman Engineering Program (FEP) launch in 2007. Dr. Richard Cassady, of Industrial Engineering continues to direct that program. The FEP provides a common academic foundation in engineering to all incoming freshman before allowing them to major in a specific engineering discipline.

Highlights

Members of the class of 2011 were hired by nationally recognized companies such as Amazon, Axiom, BNSF, Cameron, JB Hunt, Tyson Foods, and Walmart. The average starting salary for BSIE graduates was \$54,600 (high \$68,000). A number of students chose to remain at the University of Arkansas for graduate studies in Industrial Engineering and Business Administration.

The Department continues to report successes within professional societies and through personal achievements. This year the Alpha Pi Mu (APM) chapter

(faculty advisor Dr. Ashlea Milburn) received the Outstanding Chapter Award from the executive council of the national organization. The Student Chapter of the Institute of Industrial Engineers (IIE) at the University of Arkansas (faculty advisor Dr. Chase Rainwater) once again received the Frank F. Groseclose Gold Award. In addition, undergraduate student Artsiom Revin was a recipient of the Porter Stone Award. The Porter Stone Award is a \$400 faculty-selected award given each year to our outstanding Co-Op students who have completed three or more Co-Op experiences.

Industrial engineering student Robert Curry, an undergraduate student in the Department of Industrial Engineering and the Honors College, was awarded the MHIA Automated Storage & Retrieval Systems Honor Scholarship from the Material Handling Education Foundation for the 2011- 2012 academic year. The foundation, which awarded 29 scholarships in 2011, chooses scholarship winners based on academic record, research activity and an essay about their connection to material handling logistics.

In April 2011, 22 IE students received various departmental and named scholarships. The total dollar value of these scholarships exceeded \$41,000, including \$34,000 provided by our distinguished alumni group the Arkansas Academy of Industrial Engineers (AAIE).



Graduate Program Overview



The Graduate course offerings of the Industrial Engineering Department, as well as research opportunities for graduate students, continue to grow and diversify. A sampling of the published work of our graduate students, highlighted in this section, illustrates the range of research interests they are pursuing under the guidance of our faculty. Also featured in this section is our professional graduate program in Operations Management.

For students pursuing graduate studies in the field of industrial engineering we offer several options in terms of degrees, areas of specialization, and full-time or part-time studies.

Graduate degrees for on-campus students are offered in two areas:

- Master of Science in Industrial Engineering (M.S.I.E.)
- Doctor of Philosophy in Engineering (Ph.D.)

In addition to the traditional degree options, the Industrial Engineering Department also offers the following non-traditional degree program:

- Master of Science in Operations Management (M.S.O.M.)

Our faculty's wide range of expertise provides opportunities for study in a variety of areas, such as:

- Transportation, Logistics & Distribution
- Healthcare Systems Engineering
- Reliability, Maintainability & Quality Engineering
- Engineering Management
- Manufacturing & Automation
- Human Factors & Ergonomics

These areas continue to be supported by research centers and laboratories, such as:

- Center for Excellence in Logistics and Distribution
- Mack Blackwell Rural Transportation Center
- Center for Innovation in Healthcare Logistics
- Human Computer Interaction Laboratory
- Renewable Energy Laboratory

Justin Chimka serves as the Graduate Studies Committee Chairperson. More information about admission requirements and degree programs can be found at www.ineg.uark.edu/3535.php

Highlights

At the department-level we are pleased to report that in 2011 our graduate program was ranked 25th by U.S. News & World Report. During the reporting period, 660 students were enrolled in our graduate programs (29 Ph.D. students and 19 Master's of Industrial Engineering students, as well as 612 students enrolled in the Operations Management graduate program). Approximately 85% of all on-campus Industrial Engineering graduate students received some sort of financial assistance from the department through graduate research assistantships.

The Graduate Studies Committee continues to focus on recruitment of quality graduate students. Faculty are building or maintaining relations with colleagues in China, India, Latin America and Turkey. Efforts are also underway to recruit graduate students from high-quality U.S.-based programs.

Our graduate students gained recognition, awards and honors in 2011 and published or presented their research in several major venues. For example Industrial Engineering graduate students presented their work at the Industrial Engineering Research Conference, held in Reno, Nevada in May and at the INFORMS Annual Meeting, held in Charlotte, North Carolina in November.

Industrial engineering graduate student Lisa Thomas received a scholarship from the Material Handling Education Foundation for the 2011-2012 academic year. A doctoral student, Lisa was awarded the Crane

Manufacturer's Association of America Honor Scholarship and was the foundation's top scholarship winner this year. She is currently conducting research on a parameterized analytical model for warehouse design. This is a mathematical model that can take into account different parameters, such as warehouse size and order profile, in order to help warehouse owners and designers predict and optimize the capabilities of their warehouse.

"Lisa continues to excel in every aspect as a Ph.D. student and this recognition from our good friends at the Material Handling Education Foundation is very much appreciated," said Russell Meller, Hefley Professor of Logistics and Entrepreneurship and Thomas' faculty advisor.

Graduate student, Hector Vergara received the E.J. Sierleja Memorial Fellowship for the 2011-2012 academic year. The Sierleja Fellowship is awarded annually to a top graduate student whose graduate degree research is focused on rail transportation.

Vergara's research is being funded by the Arkansas Electric Cooperative Corporation (AECC) through their membership in the Center for Excellence in Logistics and Distribution (CELDi). As a major consumer of coal for their power plants, much of which is transported by rail from the Powder River Basin in Wyoming, AECC is interested in innovative solutions that will enhance their rail transportation delivery system. Vergara's research is contributing to AECC's strategy in this area. Vergara is a Ph.D. student working with Dr. Sarah Root.

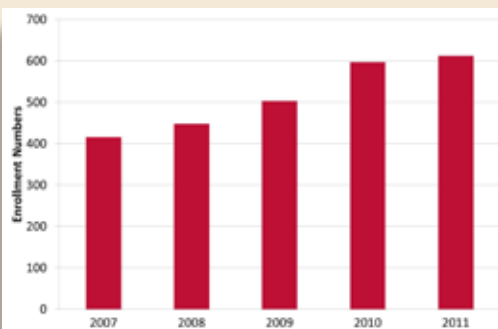
Recent Graduate Placements

Recent Ph.D. graduates of the Industrial Engineering program have received offers from both education and industry. Of those recently graduating: Jennifer Pazour, Jen received her Ph.D. and has begun her career with the University of Central Florida. Behlul Saka, Behlul has received his Ph.D. and accepted a position with Elekta. Brian Smith, Brian received his Ph.D. and accepted a teaching position at Western New England University. Yasin Unlu, Yasin completed his Ph.D. and has begun a career with LLAMA Soft, Inc.

Operations Management Program Overview



The Master of Science program in Operations Management, under the leadership of Dr. Edward Pohl, continued to grow and the program was improved for working professionals from business, industry and the military. Course enrollments grew in 2011, and with 612 students attending in the fall semester of 2011, Operations Management continued



to hold the distinction of being the largest graduate program in the University of Arkansas System. Since its inception in 1974, the program has graduated over 5,000 participants.

The Operations Management program implemented new program requirements starting fall 2011. The new standards allow the program to be more academically rigorous. The standards require students to make a grade of "B" or better in our primary courses. This ensures students are academically challenged in our foundational courses, which provides a thorough experience in Operations Management.

The Operations Management program has been honored to have Distinguished Professor and University of Arkansas Chancellor Emeritus John White join the



Dr. John A. White and Chancellor G. David Gearhart

program as a faculty member. He began teaching the course "Leadership for Operations Managers: Principles and Practices" in the spring of 2011 with the focus of exposing graduate and undergraduate honors students to leadership in action with his schedule of prominent guest speakers. A few of the speakers include Chancellor G. David Gearhart; Mike Duke, President and CEO of Walmart; Gregory Q. Brown, CEO of Motorola Solutions; and other leaders from the community. This course has been a great addition to the program allowing increased exposure throughout the University of Arkansas community.

The outstanding faculty members of the MSOM program are drawn from the university's Industrial Engineering Department and from businesses and military organizations throughout the country. There are over 50 faculty members who teach in the program. They have experience in industry and academe, and are accomplished in their respective fields.

The Operations Management program is designed for the working student who typically holds a professional or management position in an organizational setting, be it business, military, non-profit, or governmental. Program content focuses squarely on the concepts, methods, and tools that are essential to the successful management of work processes, projects, and people in a wide spectrum of organizations. The curriculum grows out of an Industrial Engineering perspective on the science of management and equips graduates to carry out their managerial responsibilities both more efficiently and more effectively. The curriculum is presented by Industrial Engineering faculty and by academically qualified business professionals who have accrued extensive managerial and industry experience in the specific subjects they teach.

Operations Management coursework emphasizes practical knowledge in areas such as project management, economic decision-making, supply chain management, human behavior analysis, quality management, and operations research, as well as many other areas of importance to today's manager. Students are able to select from 26 courses to make up the ten required to complete the degree.

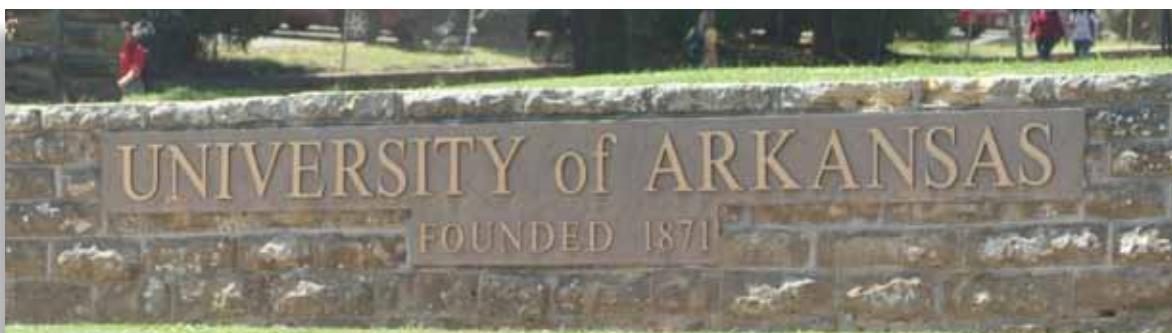
Students come to the program from three primary sources: the business world, the armed forces, and undergraduate academic programs. The corporate affiliations of our current students include numerous Fortune 500 companies such as Walmart, Sam's Club, Tyson Foods, J.B. Hunt

Transport, Fed Ex, Lockheed-Martin, and Pratt & Whitney. We are proud to be affiliated with the military and have many current military members and veterans from all branches of service. These students are deployed and stationed all around the world while pursuing their academic goals.



In addition to evening classes held on the University of Arkansas Fayetteville campus, live instruction is provided at five other graduate residence centers: Naval Support Activity Mid-South in Millington, TN; Little Rock Air Force Base in Jacksonville, AR; the Air Force Special Operations base at Hurlburt Field, FL; SAU Tech in Camden, AR; and ANC University Center in Blytheville, AR. While all program sites offer live classes, for added flexibility many courses are available online.

More information concerning the Operations Management Program can be found at msom.uark.edu.



Faculty Service and Achievements



Photo courtesy of Carrie Pennington

The Department of Industrial Engineering has enjoyed another prosperous and productive year. The Department remains a nationally ranked program and our faculty members continue to bring visibility to the department through recognition for research endeavors, awards and through service to our profession. **Dr. Richard Cassady** received the Arkansas Academy of Industrial Engineering (AAIE) Faculty Member of the Year Award. **Dr. Cassady** served as the Chair for the 2011 Reliability and Maintainability Symposium (RAMS).

Dr. Ashlea Bennett Milburn was involved in planning the IIE conference and served as the Healthcare Systems Engineering Track Chair.

Dr. Ernie Fant continues to raise the department profile in the area of renewable energy with his solar photovoltaic systems seminars. This initiative complements the University-led effort to develop an undergraduate minor in Sustainability and the College of Engineering's effort to develop a graduate certificate in Sustainable Energy.

Research work by **Dr. Steve Johnson** on independent contract drivers made national news and was featured on satellite radio. His research on speed limiters for commercial trucks also drew national interest.

Dr. Russell D. Meller, Hefley Professor of Logistics and Entrepreneurship and Director for the Center for Excellence in Logistics and Distribution (CELDi) was recognized by the Institute of Industrial Engineers when he received the prestigious David F. Baker Distinguished Research Award in 2011 for research contributions to the field of industrial engineering. One of **Dr. Meller's** research projects through CELDi focused on warehouse design and was recognized with a CELDi Success Story Award because the tools developed for Forward Area Optimization and for Facility Configuration were implemented by the sponsoring organization with a reported savings of more than \$3.5M over 5 years. CELDi nominated this success story for the Alexander Schwarzkopf Price for Technical Innovation through the National Science Foundation.

Associate professors **Dr. Heather Nachtmann** and **Dr. Ed Pohl** received national recognition for their research survey showing that the health care industry is making significant gains toward adopting global data standards for the health care supply chain. The research was sponsored by the Center for Innovation in Healthcare Logistics, working with the Health Industry Group Purchasing Association and the Association for Healthcare

Resource and Materials Management. The results of their research survey examining progress toward adoption of critical standards to increase efficiency and patient safety and reduce costs were featured in publications from the Healthcare Industry Supply Chain Institute (HISCI) and the Healthcare Supply Chain Association (HSCA).

Dr. Pohl is the Director and Chair of Studies for the Operations Management graduate program. He received the award for Outstanding Service to Students.

Dr. Nachtmann who serves as Director of the Mack-Blackwell Rural Transportation Center and Co-Deputy Director for CIHL was selected as the holder of the John L. Imhoff Chair in Industrial Engineering for 2010-2011. She focused on making significant contributions in three key areas: service to students, teaching excellence, and faculty development.

Dr. Nachtmann and her doctoral student Jing Jing Tong received the Best Paper Award for the Homeland Security Track at the Industrial Engineering Research Conference. Furthermore, **Dr. Nachtmann** was named a Fellow of ASEM at the International Annual Conference of the American Society for Engineering Management.

Dr. Kim Needy, department head and Twenty-first Century Professor in Engineering, was named a Fellow by the Institute of Industrial Engineers (IIE) in May 2011. She received her Professional Engineering Manager (PEM) Certificate from the American Society for Engineering Management (ASEM) and successfully completed the Southeastern Conference Academic Consortium (SECAC) Academic Leadership Program (ALDP).

Doctoral student Kellie Schneider, **Dr. Chase Rainwater**, and **Dr. Edward Pohl** received the 2011 William A.J. Golomski Award by the QCRE Division of IIE for the best paper authored by an IIE member at the 2011 Reliability and Maintainability Symposium (RAMS). **Dr. Pohl** served as Vice-Chair for the 2011 RAMS program.

Dr. Rainwater was named to the Arkansas FIRST Board of Directors in charge of creating and sustaining robotics engineering teams throughout the state (students ranging from 4th-12th grades). His role in this program has resulted in increased exposure for the University of Arkansas amongst numerous technical organizations throughout the country, the more than 100 other universities participating in this program, and numerous

potential engineering students. He was a mentor for the Springdale High School GearHogs who were awarded the Rookie All-Star Award for the Midwest Region and were invited to compete in the World Championships in St. Louis, Missouri.

Significant research efforts by **Dr. Ronald L. Rardin**, director of the Center for Innovation in Healthcare Logistics (CIHL) to improve safety and efficiency of radiation therapy was the feature on National Public Radio in November 2011. **Dr. Rardin** is the holder of the John and Mary Lib White Systems Integration Chair and is a Distinguished Professor of Industrial Engineering

Dr. Manuel Rossetti, Professor, received the Outstanding Teacher award within the College of Engineering. **Dr. Chang Nam**, Associate Professor, was selected as the Outstanding Researcher. **Dr. Justin Chimka** was selected by the industrial engineering students as the Best Teacher in 2011.

Dr. John A. White, Distinguished Professor of Industrial Engineering and Chancellor Emeritus was honored by the College of Engineering at the University of Florida when he was recognized for his service as an academic administrator. He received the Gator Engineering Leadership Award for applying his engineering education and experience to service in higher education, and for providing leadership in the advancement of diversity and engineering research. The award is designed to honor engineering graduates who have demonstrated leadership in innovation, education, law, medicine, industry or public policy. Additionally, Virginia Tech inducted **Dr. White** into its Academy of Engineering Excellence.

Dr. Shengfan Zhang joined the department in the fall term. Her research interests are mathematical modeling of stochastic systems with an emphasis on statistical and decision analysis as applied to health care, manufacturing and service environments. One of **Zhang's** research focuses is breast cancer treatment, and one of her goals is to develop methods for addressing the complexity of modeling this disease in diverse populations in order to create more personalized prevention strategies for early detection and treatment. We look forward to the great work she will be doing at the University of Arkansas.

External Professional Service and Leadership

Cassady, Richard

- Scholarship Trustee, Institute of Industrial Engineers
- Member, Management Committee, Annual Reliability and Maintainability Symposium
- General Chair, Annual Reliability and Maintainability Symposium
- Associate Editor, *Journal of Risk and Reliability*

Chimka, Justin

- Session Chair, INFORMS Quality, Statistics and Reliability
- Council Member, INFORMS Quality, Statistics and Reliability
- Member, Editorial Board, *International Journal of Quality Engineering and Technology*

Johnson, Steve

- Member, Board of Certification for Professional Ergonomists Exam Committee (BCPE)
- Member, Revised Exam Development Committee BCPE

Meller, Russell

- Director, NSF Industry-University Cooperative Research Center for Excellence in Logistics and Distribution
- Department Editor, *IIE Transactions on Design & Manufacturing*
- Member, Editorial Board, *Journal of Manufacturing Systems*
- Member, Editorial Board, *Transportation Research Part E: Logistics and Transportation Review*
- Member, Editorial Advisory Board, *Material Handling & Logistics*

Milburn, Ashlea Bennett

- Track Co-Chair, Industrial Engineering Research Conference, Healthcare Systems Engineering Track
- Session Chair, Industrial Engineering Research Conference
- Session Chair, INFORMS Healthcare Conference – Montreal, Canada
- Coordinator, Student Paper Competition, IIE Society for Health Systems

Nachtmann, Heather

- Chair, American Society for Engineering Education, Engineering Economy Division
- Member, National Engineering Economy Teaching Excellence Award Committee, American Society for Engineering Education
- Session Moderator, American Society for

- Engineering Education Conference
- Member, Best Dissertation Award Committee, American Society for Engineering Management
- Member, Advisory Council for Transportation Research, Arkansas State Highway and Transportation Department
- Member, Academic Council for Healthcare Supply Chain Research, Association for Healthcare Resource and Materials Management
- Session Moderator, Industrial Engineering Research Conference
- Area Editor, *The Engineering Economist* journal
- Fellow, American Society for Engineering Management

Needy, Kim

- President-Elect, Institute of Industrial Engineers
- Member, Council of Industrial Engineering Academic Department Heads for the Institute of Industrial Engineers
- Co-Chair, New Faculty Colloquium, Institute of Industrial Engineers
- Director-At-Large, American Society for Engineering Management
- Member, Board of Directors, Industrial Engineering Division of the American Society for Engineering Education
- Administrator, Construction Industry Institute, Quality Management Communities of Practice
- Member, Construction Industry Institute (CII) Academic Committee with service on the Website Sub-committee
- Book Editor, *The Engineering Economist*
- Associate Editor, *Engineering Management Journal*
- Board of Advisors, U.S. Military Academy at West Point, Department of Systems Engineering

Pohl, Edward

- Member, Awards Committee, INFORMS Military Applications Section
- Conference Chair, Reliability and Maintainability Symposium
- Cluster Co-Chair, Supply Chain Risk, INFORMS Conference
- Co-Chair, Military Operations Research Society Workshop: Risk, Trade Space, and Analytics in Acquisition Workshop
- Associate Editor, *The Journal of Military Operations Research*
- Associate Editor, *Journal of Risk and Reliability*

Rainwater, Chase

- Co-Chair, Managing Disruptions in Supply Chains, INFORMS
- Session Chair, INFORMS Healthcare Conference
- Session Chair, INFORMS Conference
- Session Chair, Industrial Engineering Research Conference

Rardin, Ron

- Member, University of Michigan Faculty Search Committee
- Reviewer, University of South Florida Promotion and Tenure Committee
- Associate Editor, International Journal of Information Systems in the Service Sector

Root, Sarah

- Session Chair, INFORMS Alternative Dispatching Methods for Truckload Transportation
- Session Chair, Institute of Industrial Engineers Composite Variable Models
- Member and Media Coordinator, INFORMS Junior Faculty Interest Group Board
- Member, Institute of Industrial Engineers Operations Research Board
- Judge, INFORMS Interaction Sessions

Rossetti, Manuel

- Associate Editor, *International Journal of Modeling and Simulation*
- Publicity Chair, 2013 Winter Simulation Conference
- Program Chair, 2015 Winter Simulation Conference

White, John

- Inductee, Virginia Tech Academy of Engineering Excellence
- Chair, Audit Committee, Motorola Solutions, Inc.
- Chair, Audit Committee, JB Hunt Transport Services, Inc.
- Member, Compensation Committee, JB Hunt Transport Services, Inc.
- Member, Nominating & Governance Committee, JB Hunt Transport Services, Inc.
- Member, Advisory Board for the Dean of Engineering, University of Florida
- Member, Nominating Committee, National Academy of Engineering
- Distinguished Lecturer, Purdue University

Zhang, Shengfan

- Session Chair, INFORMS Annual Meeting, Health Applications/Data Mining

Alumni News



Dean Saxena and
Bill Harrison

In April 2011, Bill Harrison, BSIE 1965, received the College of Engineering Distinguished Alumni Award. This award honors the exceptional professional and personal achievements of University of Arkansas College of Engineering graduates. Recipients have achieved distinction in their fields of endeavor and have provided outstanding leadership and service to the College of Engineering, and to the organizations and communities to which these distinguished alumni belong.

Bill has served as president of the Arkansas Academy of Industrial Engineering and the American Society of Heating, Refrigerating and Air Conditioning Engineers. He has spoken and given presentations at conferences and industry meetings around the world, and received a Recognition Award at the International Conference on Enhanced Building Operations. He has been active in several industry associations, including the Mechanical Contractors Association of America, the Arkansas Chapter of Associated General Contractors and the Arkansas Construction Industry Coalition.



Mr. and Mrs. Bill Keltner

In Remembrance

On August 14, 2011, the Arkansas Academy of Industrial Engineering lost a founding member, as well as our Leader of the Band – the AAIE Kazoo Band, Bill Keltner (BSIE 1959). In addition to a 33-year career with AT&T and Southwestern Bell, Bill was a founding member of the UA College of Engineering Dean's Advisory Council, and played a leadership role in numerous service organizations. One of Bill's fondest UA memories was serving as president of the Freshmen Booster Club and catching a greased pig at the half time of a Razorback football game and then having to hold the pig for the remainder of the game.

The ACADEMY *Celebration*

The Twenty-Fifth Anniversary of the Arkansas Academy of Industrial Engineering

In the mid-1980's Dr. Bob Emerson, Department Head of Industrial Engineering along with Dr. Neil Schmitt, Dean of Engineering realized that an alumni academy would be beneficial for both the IE Department and the College. They began to seek support from interested alumni. Larry Stephens (BSIE '58), embraced the cause and was the driving force that organized the Arkansas Academy of Industrial Engineering. He became its first president. The Academy was established to recognize the achievements of University of Arkansas IE graduates and to provide continuing guidance and support to the Department of Industrial Engineering.

Through the support of the Arkansas Academy of Industrial Engineering (AAIE) the department has been able to issue over \$315,000 in scholarships since 2000. Some other aspects of support provided by AAIE are evidenced through the development of SHUR. This is a program led by the members of the academy and industrial engineering students. The acronym stands for Students Helping Undergraduate Retention. SHUR provides mentoring, tutoring and social activities to new

students to aid with retention and help insure the student's success.

In addition to SHUR, the academy provides industrial engineering students with an opportunity to participate in annual mock interviews and a resume writing workshop. This exercise offers upcoming graduates a chance to interview with real-world industry leaders and important instruction on best interview practices.

While recruiting top students will always be an important job for all engineering branches, the increased number of scholarships combined with the significant financial support of the AAIE makes recruiting more successful.

25th Anniversary Celebration

This year marked a special occasion for the Arkansas Academy of Industrial Engineering as they celebrated their 25th year during the

annual banquet in April. The theme for the anniversary was "25 Years of Growth...Renewing the Spirit!" More than 200 were in attendance for the banquet including 21 past presidents, aka 'The Red Coat Society.' It was a night of remembrance and light-hearted celebration that included a performance by the AAIE Goodtime Kazoo Band.

During the evening they welcomed 10 new inductees to raise the active membership to 172! The business meeting held the next day featured discussions on the numerous ways that AAIE members are making an impact to the success of the IE department. AAIE is about supporting, mentoring and advising the industrial engineering students and department leadership. The Academy shares a mutual commitment with the department, dedication to excellence in industrial engineering education.

Some future goals of the Academy include expanding the study abroad opportunities for Industrial Engineering students and achieving a goal to raise \$100K for the Academic Scholarship Endowment. Scholarship Chair, Dewey Freeman recently reported that they are currently at 73% of that goal.



The AAIE Kazoo Band at the 25th Anniversary Celebration.

Research and Teaching Laboratories Overview



David D. and Nancy J. Foust Computation Laboratory

The David D. and Nancy J. Foust Computation Laboratory is a general computing lab open to all Industrial Engineering students. Generous funding for this lab was provided by Mr. and Mrs. David D. Foust.



Mr. Foust is a 1963 BSIE graduate from the University of Arkansas, Department of Industrial Engineering. He is also an active member and former president of the Arkansas Academy of Industrial Engineering (AAIE). Mr.

and Mrs. Foust play a significant role in the development of AAIE scholarships. The Department of Industrial Engineering is very appreciative of the continued support of David and Nancy Foust.

The Foust Computation Laboratory is INEG's premier computing and teaching lab providing general computing access for all Industrial Engineering students and supports the computing needs associated with course work. Included in the lab are a project area with whiteboards to encourage student discussions, and a separate conference area with a large LCD TV, DVD and VCR. Occupying approximately 2,100 square feet, the computer lab area can accommodate 31 students. It also functions as a general PC lab outside of class hours.

The Industrial Engineering department is committed to providing the latest in computer technology, software capability, and technical expertise to enhance the educational experience for all students. The Foust Computation Lab is open 24 hours a day throughout the semester to all faculty, staff, and students enrolled in INEG classes.

For more information: <http://www.ineg.uark.edu/5211.php>

Larry and Gwen Stephens Undergraduate Research Laboratory



The Larry and Gwen Stephens Undergraduate Research Lab provides state-of-the-art facilities including the latest computer hardware and software designed for industrial engineering projects.

The lab provides individual work space for up to 15 undergraduate students. To be eligible for a space in this lab, a student must be engaged in research with an Industrial Engineering faculty member. In addition to a workspace, 24 students assigned to the lab are provided with a laptop computer.

For more information: <http://www.ineg.uark.edu/2011.php>

Manufacturing Automation Laboratory

The AT&T Manufacturing Automation Laboratory houses four work cells where

- One work cell has integrated robotic arms (a six-axis articulating arm and a two-axis linear module)



to form a unit where the robots are moved to the work object within a range of 1200mm to 1800mm. Both robots use the same controller and programming, but different power supplies. An electric-hydraulic scissor table can lift projects within the reach of the inverted six-axis articulating arm as the arm lowers itself to the project below.

- Two vision guide robot (VGR) work cells with four-axis SCARA are available with four cameras. One of the VGR work cells was a component of an Automated Temperature Measurement system where a touch screen panel computer for system control coordinated the SCARA, temperature data logger, and conveyor.
- The last unit is a stand-alone machine vision work cell with several new lighting sources and optics for Cognex, PPT, and Banner Engineering smart cameras, which can perform research and introduce students to this technology.

The Manufacturing Automation Laboratory's purpose is for students to gain hands-on exposure to the predominant machines for automated assembly, inspection, palletizing, and measurement through research activities and instructional projects. The laboratory supports INEG 4563 Application of Robotics, INEG 4533 Application of Machine Vision, and INEG 5523 Topics in Automated Systems. This laboratory directly or indirectly supports the following objectives from these courses:

- To develop the ability to apply teach-pendant and off-line programming to perform pick and place applications for three types of industrial robots.
- To develop the ability to apply image conversion, basic processing techniques, and planning to ensure image processing.
- To develop the ability to apply human machine interface through a touch screen panel computer for system control of automation
- To develop the ability to apply electronic sensing to automation

For more information: <http://www.ineg.uark.edu/2011.php>

RFID Laboratory

The RFID Laboratory is a state-of-the-art facility housing more than \$500,000 worth of equipment. In February 2007, the laboratory was expanded from the old material handling laboratory and a next-generation collaborative learning environment for both on-campus and off-campus students was developed. User-friendly, web-based applications which provide access to off-site students



were built. A motorized hardware system was assembled in order to provide RFID technology testing setups in the laboratory. An agent-based architecture was used to build the hardware and software framework to make experiment setups more flexible.

The software infrastructure was constructed with a view to enabling interaction among the diverse devices in this environment. The effort was supported by the National Science Foundation, Division of Undergraduate Education, Course, Curriculum, and Laboratory Improvement Program under award No: 0633334. For more information: <http://www.ineg.uark.edu/5228.php>

Renewable Energy Laboratory

The laboratory is used to enhance learning by providing hands-on instruction and education promoting renewable energy application opportunities for residential, small business, farming, schools, and small communities throughout the State of Arkansas.

The lab has an operating 400 Watt Photovoltaic Array, 208VAC, 3 Phase (industrial use) with an energy management unit which provides energy generation reporting to an offsite website.



In the spring of 2010 a one-day photovoltaic array seminar was opened to students and the general public. This workshop included a tour to visit a one-axis, chronological tracking, pole mounted, two solar panel residential array. It also features a 380 watt capacity of 240 VAC, one phase, which is being fed to the control panel. The chronological tracking allows the two panels to be within one degree each week of where the sun is at its highest point in the sky.

The one day photovoltaic seminar has been presented two to four times per year based upon requests from the community. Three participants in the seminar have built their own PV arrays for their residences and are successfully net metering with investor owned electrical companies and electrical cooperatives. One of the arrays, located on a family farm, is being used to educate elementary school children on how modern farms operate.

The objective is to keep the course lectures and laboratory current. Literature research is made constantly to identify updates of the advancement of successful implementation of renewable energy sources.

For more information: <http://www.ineg.uark.edu/5702.php>

Advisory Board

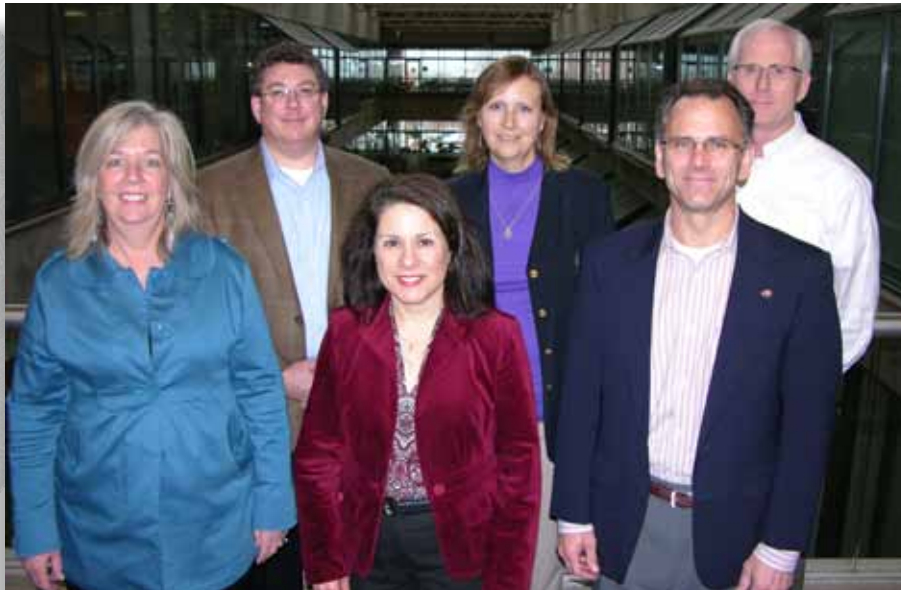


Photo courtesy of Alex Mironoff

*Melinda Faubel, Grant DuCote, Dr. Kim LaScola Needy,
Dr. Alice Smith, Gary Whicker, Lee Hartz*

The Arkansas Academy of Industrial Engineering (AAIE) organizes a liaison committee that serves in the capacity of an advisory board to the department. The committee is comprised of accomplished professionals from business and industry who bring both an applied perspective and an independent assessment to the industrial engineering program at the University of Arkansas.

The members of the 2011 Liaison Committee are:

- **Melinda Faubel**, Director of External Affairs - AT&T, AAIE Past President
- **Grant DuCote**, Strategy Director with Walmart Supply Chain Innovations, AAIE President Elect



- **Dr. Alice Smith**, Ph.D., Professor and Chair, Auburn University
- **Gary Whicker**, Sr. Vice President, J.B. Hunt Transport Incorporated
- **Lee Hartz**, Walgreens IT Organization, Homecare Division, AAIE President

The AAIE was founded in 1986 to recognize the achievements of University of Arkansas Industrial Engineering graduates and to provide continuing guidance and support to the Department of Industrial Engineering. The Academy also provides its members with the opportunity to nurture the organization that played an important role in their professional growth and development. Academy members provide tremendous financial resources that endow many scholarships for the Industrial Engineering students.

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