

Department of
Industrial Engineering
2010 Annual Report



UNIVERSITY OF
ARKANSAS
COLLEGE OF
ENGINEERING



Photo courtesy of Karen Standley

CONTENTS

2	Faculty
6	Research <ul style="list-style-type: none">Mack-Blackwell Rural Transportation CenterCenter for Excellence in Logistics and DistributionCenter for Innovation in Healthcare Logistics
12	Publications
15	Grants
17	Undergraduate Program
19	Graduate Program <ul style="list-style-type: none">Operations Management Program
23	Faculty Service and Achievements
27	Research / Teaching Labs
30	Advisory Board
31	Contact Information

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:

Greetings! I am pleased to report another successful year. The Department rolled out a new five-year strategic plan in the fall with the following vision:

To be a nationally-competitive, student-centered, Industrial Engineering program serving Arkansas and the world through undergraduate and graduate studies, through leading-edge research programs, through contributions to the profession, and through our unique access to major organizations with world-class logistics and distribution operations. To be a model program providing a broad, personalized undergraduate experience, contemporary graduate and professional programs, and research emphasizing the application of quantitative modeling and analysis. To be leaders in the industrial engineering profession.

Underpinning this plan are five separate, but integrated objectives in undergraduate education, graduate education, research, service and department visibility, which will be achieved through completion of six crosscutting strategic initiatives. This strategic plan creates a shared vision for our stakeholders to guide both our short-term and long-term decision making.

There have been numerous accomplishments in 2010. Alumni and employer surveys were launched in support of continuous improvement efforts for our undergraduate program. In addition, extensive updates were made to departmental laboratories. In an effort to recruit more high quality graduate students, an agreement of cooperation and exchange was established between the U of A and Universidad Centroamericana. Our Operations Management Program experienced record enrollments while simultaneously implementing refinements to the program aimed at improving quality. Research efforts remained strong, with funding reaching \$2.5M. And in the fall of 2010, the department initiated a new faculty search which came to a successful completion in 2011.

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. You will like what you see!

Warmly,

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

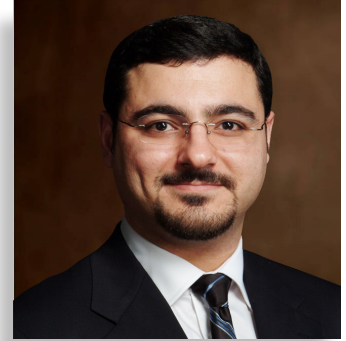
FACULTY

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)

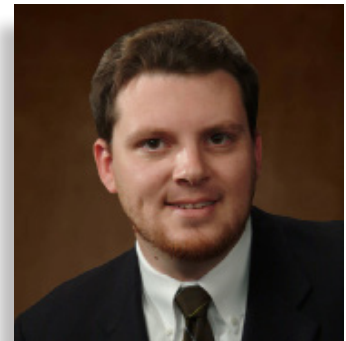


Justin R. Chimka, Ph.D. Associate Professor

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:

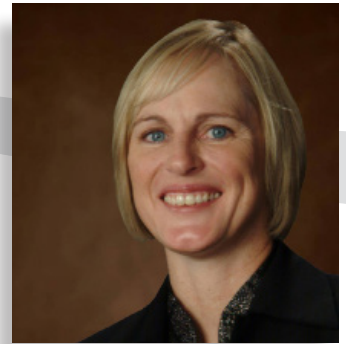
- Ph.D. (Texas Tech)
- M.S.I.E. (Southern Methodist University)
- B.S.I.E. (University of Arkansas)



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., P.E., CPE
Professor

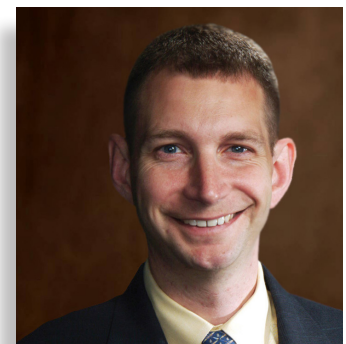
Dr. Johnson's research interests have spanned the continuum from occupational ergonomics (e.g., hand tool design, reduction of musculoskeletal disorders, development of computer-based job analysis systems) to in-vehicle information, communication and entertainment systems in commercial trucks and automobiles. 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.

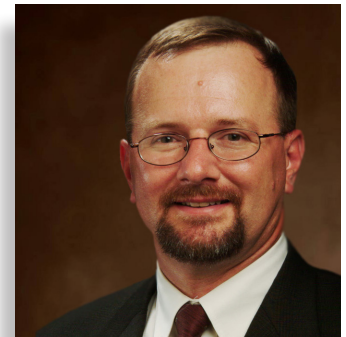
Education:
Ph.D. (Virginia Tech)
M.S.I.E. (SUNY at Buffalo)
M.A.B.A. (Sogang University)
B.S.I.E. (SungKyunkwan University)



**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.



RESEARCH

Overview

MACK-BLACKWELL

Rural Transportation Center

The Mack-Blackwell Rural Transportation Center (MBTC) operates as a U.S. Department of Transportation (DOT) University Transportation Center and is a member of the National Transportation Security Center of Excellence (NTSCOE) of the U.S. Department of Homeland Security (DHS). MBTC is directed by Dr. Heather Nachtmann, Associate Professor of Industrial Engineering.

Industrial Engineering faculty played an active role in MBTC's DOT research program this year. Drs. Chase Rainwater and Ashlea Bennett Milburn were awarded a new project entitled "Rail Transportation Models for Rural Populations." This project is developing the first integrated rail planning model for linear structured path networks and designing/implementing customized solution techniques. This research will benefit Northwest Arkansas and other rural societies by providing a planning tool for the efficient allocation of municipal funds for a rail transit system that provides long-term congestion relief and environmental benefits. Dr. Steven Johnson, through the Truckload Carriers Association (TCA), is investigating the reasons why a driver would choose to be an independent contract driver/operator as opposed to being a company driver. The objective of his research effort is to develop, administer and analyze a survey instrument that will provide reliable, valid and useful information regarding the reasons for choosing or not choosing to be an independent contractor. Dr. Edward Pohl, together with Dr. Scott Mason of Clemson University completed a project on "Network Design Analysis for Special Needs Student Services" that investigated models and algorithms for maintaining administration-based transportation financial performance measures while simultaneously designing

smarter transportation networks that assign special needs services to schools taking in to account both student geographical location and service needs.

Contributing to MBTC's NTSCOE program, there were several projects led by Industrial Engineering faculty. In 2010, Drs. Edward Pohl, Ashlea Bennett Milburn, and Chase Rainwater along with Dr. Scott Mason of Clemson University, began working on a new project, entitled "Mitigating Dynamic Risk in Multi-Modal Perishable Commodity Supply Chain Networks," that develops decision support models to mitigate dynamic risk caused by an adversary with an unknown, adaptive objective. The project seeks to optimize allocation of scarce fortification resources for transportation infrastructure components in perishable commodity supply chain networks. Drs. Heather Nachtmann, Justin Chimka, Edward Pohl and Letitia Pohl, MBTC Assistant Director, began work on a new project, entitled "Supporting Secure and Resilient Inland Waterways," that focuses on developing a prototype



decision support system which would provide timely knowledge and awareness of what cargo should be prioritized for off-loading during emergency response and what infrastructure exhibits low resiliency in terms of modal capacity to potential attacks or natural disasters against inland waterway transportation systems. Drs. Ed Pohl and Chase Rainwater, along with Dr. Scott Mason of Clemson University, continued their work on "Designing Resilient and Sustainable Supply Chain Networks." Their research explores the resiliency and sustainability of supply chain systems. Drs. Heather Nachtmann and Ed Pohl continue their research on "Emergency Response via Inland Waterways" by identifying and measuring the feasibility of inland waterways to provide transportation support in general emergency response conditions. "Sustaining Resilient Inland Waterways via Renewable Energy," led by Dr. Heather Nachtmann, along with Letitia Pohl, MBTC Assistant Director, explores how renewable energy sources can be utilized to support inland waterway operations and security. Dr. Justin Chimka completed his research on "Information Enhancement Among Aviation Security Partners." This project identified models of general aviation activity that can be used to detect signs of potential attacks and develop reporting standards.

**NSF CAREER Award for
We Feel SCIENCE:**

*We Engage with the Flexible Experimental Environment for Learning in SCIENCE
(Award No. DRL-0953772)*

The main goal of this project is to develop collaborative haptic interaction techniques that allow users, particularly students with severe visual impairments, to work together in computer applications through the sense of touch (e.g., force, tactile, and temperature sensation). In this NSF CAREER project, Dr. C.S. Nam will design, evaluate, and implement a haptically enhanced learning-by-collaborating system



that allows students with and without visual impairments to collaborate in hands-on science lessons through multiple, realistic and compatible sensory feedback (i.e., haptic, visual, and auditory). The social constructivist learning and participatory design practices, which are the driving design principles behind the techniques and applications, should demonstrate the successful application of theories and evaluation metrics that are inclusive, pluralistic, and generalizable to many other haptic learning system developments.



Dr. C.S. Nam

This work will also allow a better understanding of the cognitive and affective impacts of a sensory-based learning-by-collaborating system on science education for students with and without visual impairments. Specifically, this work should allow STEM (Science, Technology, Engineering and Mathematics) access for students with disabilities and ultimately, globally-competitive scientists and engineers who have disabilities but are capable of significant contributions.

**CELDi: Research, Renewal
and Membership Value**



Research with bottom-line impact remains a driving principle in the Center for Excellence in Logistics and Distribution

(CELDi), headquartered at the University of Arkansas. In addition to solving real problems for our members, tackling large issues confronting our world through fundamental research is another exciting part of CELDi work. The "Cloud Computing and Large-Scale Supply Chain Networks" project (PI: Dr. Manuel Rossetti) and the "Physical Internet Initiative" project (PI: Dr. Russell Meller) both represent exciting Center activities, initiated in

2010, that position CELDi for a key role in re-envisioning our logistics and distribution system today.

Research partnerships between CELDi faculty at the University of Arkansas and our member organizations include Arkansas Electric Cooperatives Corporation, Invistics, Medline Industries, Red River Army Depot, and Sam's Club. These year-long CELDi in-context projects achieve:

- Solving real problems with bottom-line impact
- Graduating students with real-world project experience
- Sharing research results among member organizations to leverage intellectual and monetary capital
- Producing generalized, cutting-edge research that is published in leading journals

The 2010 portfolio of projects resulted in training and jobs for students and innovative solutions for logistics and distribution excellence, with success stories that affected bottom-line performance.

CELDi is a partnership between the National Science Foundation (NSF), nine major research universities, and more than 30 member organizations in commercial,



Photo courtesy of Kelley O'Callaghan

military and government sectors of the economy. Throughout 2010, researchers at CELDi worked to fulfill the Center's mission of enabling member organizations

to achieve logistics and distribution excellence by delivering meaningful, innovative and implementable solutions that provide a significant return on investment. Research endeavors at CELDi are driven and sponsored by the member organizations, which specialize in distribution, transportation, manufacturing, information technology, and software solutions. CELDi also sponsored projects in education, such as the popular "IE Challenge," which directly benefit this region's middle and high school students and teachers by bringing science and engineering into the classroom.

In 2010, Center Director Dr. Russell D. Meller led the CELDi Site Directors and staff through a busy year implementing the program outlined in last year's strategic planning initiative - a plan for growth and a vision of going from "Good to Great." The focused member-university recruiting effort has continued to deepen and broaden the expertise of CELDi. The University of California Berkeley joined CELDi and offers a new CELDi focus area for research in Biopharmaceutical Operations. A new marketing initiative and a CELDi website have contributed to increasing name recognition, facilitating growth and enhancing member communications. Students and members alike have welcomed a host of new member-student interactions at CELDi research meetings.

The success of CELDi's program for growth will be measured by the impact of its research, the value created through the synergy of its member organizations and member universities, and ultimately, by the professional success of all personnel involved in its endeavors. As CELDi has laid the foundation for these initiatives with the participation and support of its members, university partners and the leadership at the NSF, we look forward to developing more exciting opportunities for CELDi students, researchers and members. New members and universities are always welcome.

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 between healthcare professionals and their industrial organizations, joining with Center staff in intensive but objective engineering analysis of supply chain challenges with system-wide



reach. 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 provide additional further resources, expertise and test sites. They include AHRMM (Association for Healthcare Resource & Materials Management), SMI (Strategic Marketplace Initiative), GS1 Healthcare US, Proctor & Gamble, IBM, and collaborating hospital partners. The Center was led in 2010 by Dr. Ron Rardin, Director, and Drs. Edward Pohl and Heather Nachtmann, Co-Deputy-Directors. In all, it has involved 8-10 Industrial Engineering faculty, 2 postdoctoral fellows, 10-12 graduate assistants, and 2 central members. Projects in 2010 include the following:

- “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 (soon to be widely distributed free to users) which enumerates required provider investments, and quantifies in detail the process impacts that can be expected.
- “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 and HIGPA) 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.

- “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.
- “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.

An important new CIHL project is investigating supply chain aspects of home health. With the help of industrial organizations, the Center has conducted surveys of a broad sample of current providers. Results are now leading to best practices with a focus on more efficient utilization of resources (e.g. nurses, supplies, and transportation).

Healthcare Systems Engineering (HSE) Education and Research Leadership Workshop, May 20-21, 2010

It is well recognized in everything from the ongoing debate over healthcare reform to a series of national

reports, that the systems for delivering healthcare in the United States are in a crisis of inconsistent and sometimes dismal quality, safety and efficiency with vastly unequal access and exploding costs. While a few pioneering health systems engineering (HSE) programs in academia have focused for decades on engineering delivery 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



Photo courtesy of Stacey Bloomfield

achieved, the Industrial Engineering Department hosted a workshop of HSE program leaders on the University of Arkansas campus May 20-21, 2010. The organizing Committee consisted of Drs. Ronald Rardin, Nebil Buyurgan, Ed Pohl, and Ashlea Bennett Milburn. The workshop was funded in part by the National Science Foundation.

Faculty representatives attended from 21 U.S. and Canadian Universities that have HSE research or education programs (including U of A), along with 30 of their graduate students who submitted 25 research posters. Data was also collected on the current state of HSE research and education in a questionnaire

distributed before the meeting. Responses were received from 22 academic programs, and results were summarized to stimulate discussion during the workshop.

The workshop reached a series of conclusions about how HSE education programs should advance including (1) certificate programs are a good way to begin forming HSE curricula; and (2) HSE educational offerings of all types can benefit from exposing engineering students to the actual environment of healthcare delivery in projects or internships, and by attracting both engineering

students and their counterparts from medicine, nursing, pharmacy, public health and similar programs to share in bi-directional coursework. Attendees also concluded that HSE academic programs would benefit from coming together in a Healthcare Systems Engineering Alliance (HSEA) to synergize the individual efforts of member programs in healthcare delivery research and education through annual meetings and other continuing activities that foster broad collaboration.

*“At the University of Arkansas,
we believe that we have a higher mission
than just the education of students...
the larger function of the university
is to improve the life of the student,
the state, and society at large.”*

Chancellor David Gearhart



University Relations, University of Arkansas

PUBLICATIONS

In 2010 the faculty of the Department of Industrial Engineering at the University of Arkansas published two books, contributed three book chapters, published 23 refereed journal articles, 33 other refereed publications, made 20 contributions to unrefereed publications and proceedings, and offered 90 invited lectures and oral presentations. The faculty authors are indicated in bold face type.

Textbooks

Meller, R.D., B. Montreuil, and M.K. Ogle. *Progress in Material Handling Research: 2010*, Editors: K.P. Ellis, K.R. Gue, R.B.M. de Koster, Charlotte, NC: Material Handling Institute, December 2010.

Tompkins, J.A., **J.A. White**, Y.A. Bozer, and J.M.A. Tanchoco. *Facilities Planning, 4th edition*, New York, NY: John Wiley & Sons, Inc., January 2010.

Chapters in Textbooks or Handbooks

Meller, R.D., and L.M. Thomas. *Optimizing Distribution Center Configuration: A Practical View of a Multi-Objective Problem*, Charlotte, NC: Material Handling Institute, December 2010.

Apple, J.M., Jr., **R.D. Meller**, and J.A. White, Jr. *Empirically-Based Warehouse Design: Can Academics Accept Such an Approach?* Charlotte, NC: Material Handling Institute, December 2010.

Montreuil, B., **R.D. Meller**, and E. Ballot. *Towards a Physical Internet: The Impact on Facilities and Material Handling Systems Design and Innovation*, Charlotte, NC: Material Handling Institute, December 2010.

Refereed Journal Articles

Buyurgan, N., **M.D. Rossetti**, and R.T. Walker, "An Analysis of Imperfect RFID Visibility in a Multi-Echelon Supply Chain." *International Journal of Logistics Systems and Management*, Vol. 7 No. 10 (2010): 431-455

Ertem, M.A., **N. Buyurgan**, and **M.D. Rossetti**, "Multiple-Buyer Procurement Auctions Framework for Humanitarian Supply Chain Management." *International Journal of Physical Distribution and Logistics Management*, Vol. 40 No. 3 (2010): 202-227

Lehlou, N., **N. Buyurgan**, and **J.R. Chimka**, "An EIA Agent-Based Architecture for Online RFID Learning Environment." *Computers in Education Journal*, Vol. 1 No. 2 (2010): 87-104

Buyurgan, N., **M.D. Rossetti**, and R.T. Walker, "An Analysis of Imperfect RFID Visibility in a Multi-echelon Supply Chain." *International Journal of Logistics Systems Management*, Vol. 7 No. 4 (2010): 431-455

Chimka, J.R. and Q. Hong, "A simple new demerit system." *International Journal of Performability Engineering*, Vol. 6 No. 1 (2010): 103-105

Chimka, J.R. and H. Wolfe, "Comparing with Relative Accuracy Two Independent Ordinal Samples." *Quality Technology & Quantitative Management*, Vol. 7 No. 2 (2010): 185-198

Hong, Q. and **J.R. Chimka**, "A demerit system for binomial distributed defects applied to medication error severity data." *International Journal of Quality Engineering & Technology*, Vol. 1 No. 4 (2010): 427-440

Ellis, K.P., **R.D. Meller**, J.H. Wilck, P.J. Parikh, and F. Marchand, "Effective Material Flow for Assembly Operations at Volvo Trucks." *International Journal of Production Research*, Vol. 48 No. 23 (2010): 7195-7217

Pazour, J.A., **R.D. Meller** and L.M. Pohl, "A Model to Design a National High-Speed Rail Network for Freight Distribution." *Transportation Research Part A: Policy and Practice*, Vol. 44 No. 3 (2010): 119-135

Meller, R.D., Z. Kirkizoglu, and W. Chen, "A New Optimization Model to Support a Bottom-Up Approach to Facility Design." *Computers & Operations Research*, Vol. 37 No. 1 (2010): 42-49

Mason, S.J., **R.D. Meller**, L.M. Thomas, J.A. Pazour, and **S.E. Root**, "Survey of Hospital Pharmacy Directors: Assessment of the Current State of Unit-Dose Acquisition." *Journal of Pharmacy Technology*, Vol. 26 No. 1 (2010): 3-8

Meller R.D., J.A. Pazour, L.M. Thomas, S.J. Mason, **S.E. Root**, and W.W. Churchill, "Third-party repackaging in hospital pharmacy unit dose acquisition." *American Journal of Healthy Systems Pharmacy*, Vol. 67 No. 13 (2010): 1108-1114

Parikh, P.J. and **R.D. Meller**, "A Note on Worker Blocking in Narrow-Aisle Order Picking Systems When Pick-Time is Stochastic." *IIE Transactions on Design & Manufacturing*, Vol. 42 No. 6 (2010): 392-404

Parikh, P.J. and **R.D. Meller**, "A Travel-Time Model for a Person-Onboard Order Picking System." *European Journal of Operational Research*, Vol. 200 No. 2 (2010): 385-394

Nachtmann, H., M.A. Waller, and D. Rieske, "The Impact of Point-of-sale Data Inaccuracy and Inventory Record Data Errors." *Journal of Business Logistics*, Vol. 31 No. 1 (2010): 149-158

Li, Y., **C.S. Nam**, B.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 No. 1 (2010): online

Nam, C.S., Y. Li, and S. Johnson, "Evaluation of P300-Based Brain-Computer Interface (BCI) in Real-World Contexts." *International Journal of Human-Computer Interaction*, Vol. 26 No. 6 (2010): 621-637

Kim, S., T. Lockhart, and **C.S. Nam**, "Leg Strength Comparison among Three Different Age Groups; Are Middle-age Workers Safer than Older Workers?" *International Journal of Industrial Ergonomics*, Vol. 40 No. 3 (2010): 315-320

Gokhan, N.M., **K.L. Needy**, and B.A. Norman, "Development of a Simultaneous Design for Supply Chain Process for the Optimization of the Product Design and Supply Chain Configuration Problem." *Engineering Management Journal*, Vol. 22 No. 4 (2010): 20-30

Bilec, M.M., M. Geary, R.J. Ries, **K.L. Needy**, and M. Cashion, "A Method for Quantifying the Benefits of Greening a Healthcare Facility." *Engineering Management Journal*, Vol. 22 No.3 (2010): 3-11

Jampani, J., **E.A. Pohl**, S.J. Mason, and L. Monch, "Integrated Heuristics for Scheduling Multiple Jobs in Complex Job Shop." *International Journal of Metaheuristics*, Vol. 1 No. 2 (2010): 156-180

Aouam, T., **R. Rardin**, and J. Artalejo, "Robust Strategies for Natural Gas Procurement." *European Journal of Operational Research*, Vol. 205 (August 2010): 151-158

Rossetti, M.D., N. Buyurgan, A. Bhonsle, S. Gumrukcu, and K. Chittoori, "An Analysis of the Effect of Inventory Record Inaccuracy in a Two-Echelon Supply Chain." *International Journal of Inventory Research*, Vol.1 No. 2 (2010): 174-208

Refereed Conference Proceedings and Other Refereed Publications

Ertem M.A., and **N. Buyurgan**, "A Procurement Auctions-based Framework for Disaster Relief Operations.," *Proceedings INFORMS Annual Meeting*, Austin, TX, (November 2010)

Buyurgan, N., S. Landry, and R. Philippe, "Automating Operating Room Logistics Processes with RFID." *Proceedings INFORMS Annual Meeting*, Austin, TX, (November 2010)

Burbano, A., **N. Buyurgan**, A. Hajiyev, R. Jayaraman, N. Lehlou, J. Pazour, **R. Rardin**, V. Varghese, "Benefits of GS1 Data Standards Adoption in Pharmacy Supply Chain Operations." *Industrial Engineering Research Conference Proceedings (IERC)*, Cancún, Mexico, (June 2010)

Schluterman, H.A., K. Schneider, and **C.R. Cassady**, "Evaluating Engineering Problem Solving Skills of First-Year Engineering Students." *Proceedings of the 2010 Midwest Section Conference of the American Society for Engineering Education*, Lawrence, KS, (September 2010)

Cassady, C.R., and G. Secuban, "Analysis of Freshman-to-Sophomore Retention in Year Two of a First-Year Engineering Program." *Proceedings of the 2010 ASEE Annual Conference & Exhibition*, Louisville, KY, (June 2010)

Cassady, C.R., "An Introduction to Probabilistic Methods in Reliability and Maintainability." *Tutorial Notes of the 2010 Reliability and Maintainability Symposium*, San Jose, CA, (January 2010)

Nachlas, J.A., and **C.R. Cassady**, "A General Framework for Modeling Equipment Aging." *Proceedings of the Annual Reliability and Maintainability Symposium*, San Jose, CA, (January 2010)

St. John, D., and **C.R. Cassady**, "Analysis of Customized Warranty Policies for Heterogeneous Populations." *Proceedings of the Annual Reliability and Maintainability Symposium*, San Jose, CA, (January 2010)

Chenoweth, M. and **E. Fant**, "Small Communities Offset Electricity Expenses Using Photovoltaic Arrays." *Proceedings 31st Annual ASEM National Conference*, Rogers, Arkansas, (October 2010)

Wasson, J. and **E. Fant**, "Promotion of Use for Small Photovoltaic Arrays." *Conference Proceedings 31st Annual ASEM National Conference*, Rogers, Arkansas, (October 2010)

Johnson, S.L. and D. Murray, "Empirical Analysis of Truck and Automobile Speeds on Rural Interstates: Impact of Posted Speed Limits." *Transportation Research Board (TRB) Annual Meeting*, Washington, DC, (January 2011)

Pohl, L.A., **R.D. Meller** and K.R. Gue, "A New Aisle Design for Dual-Command Travel." *Proceedings of the 2010 Industrial Engineering Research Conference*, Cancún, Mexico, (May 2010)

Evans, E., **H. Nachtmann**, and **K.L. Needy**, "A look into the engineering economy education literature." *Proceedings 2010 American Society for Engineering Education Annual Conference*, Louisville, KY (2010)

Smith, B.K., **H. Nachtmann**, H., and **E.A. Pohl**, "A Balanced Scorecard Approach to Ensuring Healthcare Supply Chain Performance." *Proceedings of the 31st American Society of Engineering Management Conference*, Rogers, AR, (October 2010)

Smith, B.K., **H. Nachtmann**, and **E.A. Pohl**, "Kaizen Event Effectiveness via Healthcare Logistics Data Standardization." *Proceedings of the 2010 Industrial Engineering Research Conference*, Cancún, Mexico, (June 2010)

Johnson, S., T. Yamaguchi, Y. Li, H. Kim, and **C.S. Nam**, "Analyzing the Behavior of Users with Visual Impairments in a Haptic Learning Application." *Proceedings International Conference on Applied Human Factors and Ergonomics*, Miami, FL, (May 2010)

Cashion, M.K. and **K.L. Needy**, "An Empirical Study of LEED Certification in Public Libraries." *Proceedings of 2010 American Society for Engineering Management*, Rogers, AR (2010)

Scala, N.M., **K.L. Needy**, and J. Rajgopal, "Using the Analytic Hierarchy Process in group decision making for nuclear spare parts." *Proceedings 2010 American Society for Engineering Management*, Rogers, AR (2010)

Claypool, E., B. Norman, and **K.L. Needy**, "Identifying important risk factors in design for supply chain." *Industrial Engineering Research Conference Proceedings*, Cancún, Mexico (2010)

Scala, N.M., J. Rajgopal, and **K.L. Needy**, "Influence diagram modeling of nuclear spare parts process." *Industrial Engineering Research Conference Proceedings*, Cancún, Mexico (2010)

Ries, R., **K.L. Needy**, A. Bansal, and F.K. Turan, "Quality Management Systems in the Capital Facilities Delivery Industry: Analysis of Best Practices in Leadership and Third-Party Certification." *2010 ASCE Construction Research Congress Proceedings*, Calgary, Alberta, Canada (2010)

Blinzler, M., and **E.A. Pohl**, "The Role of Information Technology Professionals in Total Quality Management." *Proceedings of the 31st American Society of Engineering Management Conference*, Rogers, AR, (October 2010)

Slagado, M., B. Menezes, and **E.A. Pohl**, "Developing Expert Opinion Based Models for Critical Infrastructure Risk Assessment and Vulnerability Analysis." *Proceedings of the 2010 Industrial Engineering Research Conference*, Cancún, Mexico, (June 2010)

Yeung, T., and **E.A. Pohl**, "Introduction to Optimization Methods in Reliability and Maintainability." *Tutorial Notes, Reliability and Maintainability Symposium*, San Jose, CA, (January 2010)

Malaviya, A., **C. Rainwater**, and T.C. Sharkey, "Multi-period network interdiction models with applications to city-level drug enforcement." *Industrial Engineering Research Conference Proceedings* (IERC), Cancún, Mexico, (June 2010)

Agrali, S., Geunes, J.P. and **Rainwater, C.**, "A Component Procurement Planning and Product Portfolio Design." *Industrial Engineering Research Conference Proceedings* (IERC), Cancún, Mexico, (June 2010)

Rardin R., N. Buyurgan, E.A. Pohl, and A.R. Bennett, "Healthcare Systems Engineering Research and Education Leadership Workshop." *NSF CMMI Research and Grantee Conference*, Atlanta, GA, (2010)

Burbano, A., **R. Rardin, E.A. Pohl**, "Dynamics of Identification Standards Adoption in the US Healthcare Supply Chain." *Industrial Engineering Research Conference Proceedings* (IERC), Cancún, Mexico, (June 2010)

Rossetti, M.D. and Q. Ni, "Simulating Large-Scale Evacuation Scenarios in Commercial Shopping Districts Methodologies and Case Study." *Proceedings of the 2010 Winter Simulation Conference*, B. Johansson, S. Jain, J. Montoya-Torres, J. Hugan, and E. Yücesan, editors, Piscataway, New Jersey, (2010)

Rossetti, M.D. and Y. Xiang, "Simulating Backlog and Load Building Processes in a Two-Echelon Inventory System." *Proceedings of the 2010 Winter Simulation Conference*, B. Johansson, S. Jain, J. Montoya-Torres, J. Hugan, and E. Yücesan, editors, Piscataway, New Jersey, 2010

Unlu, Y., and **Rossetti, M.D.**, "Safety Stock Adjustment to Meet Desired Service Level Requirements." *Proceedings Industrial Engineering Research Conference* (IERC), A. Johnson and J. Miller, editors, Cancún, Mexico, (June 2010)

Nguyen, H., Q. Ni, and **M.D. Rossetti**, "Exploring the Cost of Forecast Error in Inventory Systems." *Proceedings Industrial Engineering Research Conference* (IERC), A. Johnson and J. Miller, editors, Cancún, Mexico, (June 2010)

White, J.A., K.E. Case, and D.B. Pratt, "On the Differences Among 'Equivalent' Loan Payment Plans." *Proceedings ASEE Annual Conference*, Lexington, KY, (June 21, 2010)

GRANTS

During 2010, the following research grants were active. Project PIs are indicated in bold face type.

Buyurgan, Nebil, and Justin Chimka, National Science Foundation, \$149,709, "Integrated Auto-ID Technology for Multidisciplinary Undergraduate Studies (I-ATMUS)," 2007-2010

Chimka, Justin, Arkansas Biosciences Institute, \$36,997, "Developing Quality Control Standards to Evaluate Microarray Studies," 2009-2010

Chimka, Justin, Department of Homeland Security, \$130,147, "Information Enhancement Among Aviation Security Partners," 2009-2010

Fant, Earnest, and Nebil Buyurgan, Red River Army Depot/CELDi, \$50,000, "Robotic Kitting of Rubber Products" 2009-2010

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

Meller, Russell D., National Science Foundation, \$1,051,936, "CELDi Center Administration," 2002-2011

Meller, Russell D. and Montreuil, Benoit, National Science Foundation, \$57,624, "Designing Material Handling Systems and Facilities for the Physical Internet," Material Handling Industry of America," 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," National Science Foundation, 2007-2011

Meller, Russell D., National Science Foundation, \$6000, "REU: Designing Distribution Centers for a Service Economy," 2006-2010

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

Meller, Russell D., Medline/CELDi, \$50,000, "Distribution Center Space and Dock Door Configuration," 2009-2010

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

Meller, Russell D. and Kimberly P. Ellis, National Science Foundation, "Establishing the Logistics System Gain Potential of the Physical Internet," National Science Foundation, \$197,140, 2010-2012

Meller, Russell D., American Air Liquide, American Transportation Research Institute, The Boeing Company, Hewlett-Packard, J.B. 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, Wal-Mart, \$80,0000, "Physical Internet Initiative," 2010-2012

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

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

Nachtmann, Heather, Justin Chimka, Ed Pohl, and Tish Pohl, Department of Homeland Security, \$224,714.15, "Supporting Secure and Resilient Inland Waterways," 2010-2012

Nachtmann, Heather and Kevin Hall, Arkansas State Highway & Transportation Department, \$50,000, "Mack-Blackwell Rural Transportation Center Distinguished Lecture Series," 2000-2010

Nachtmann, Heather and Kevin Hall, Department of Homeland Security, \$653,104, "Mack-Blackwell Transportation Center, University Transportation Center Administration", 200-2012

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

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," 2009-2010

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

Needy, Kim and Bryan A. Norman (University of Pittsburgh), National Science Foundation/Center for e-Design, \$50,000, "Collaborative Research: A TIE Research Program on e-Design for Design for Supply Chain, 2007-2010

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, \$40,000, "Research Experiences for Teachers," 2009-2010

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

Pohl, Edward and Scott Mason, Department of Transportation, \$50,000, "Network Design Analysis for Special Needs Student Services" 2009-2010

Pohl, Ed, Ashlea Bennett, 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 Bennett, US Department of Transportation, \$43,983.82, "Rail Transportation Models For Rural Populations," 2010-2011

Rardin, Ronald, National Science Foundation, \$121,213, "Optimization of Intensity Modulated Radiation Therapy with Time Varying", 2008-2010

Rardin, Ronald, Director, Edward Pohl and Heather Nachtmann, Co-Deputy Directors, Corporate and Professional Sponsors of the Center for Innovation in Healthcare Logistics \$2,930,000, (All projects), 2007-2012. Active projects during 2010:

- **Ronald Rardin** and **Nebil Buyurgan**, *Provider Adoption of GS1 Standards for Product and Location Identification*, \$724,000, 2009-2012
- **Heather Nachtmann** and **Edward Pohl**, *Identifying Opportunities for Cost & Quality Improvements in Healthcare Logistics*, \$336,000, 2008-2012
- **Edward Pohl**, **Manuel Rossetti**, and **Heather Nachtmann**, *Retail vs. Healthcare Supply Chain Gaps*, \$238,000, 2010-2012
- **Ashlea Bennett** and **Scott Mason (Clemson)**, *Supply Chains for Home Healthcare*, \$106,000, 2010-2012

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

Root, Sarah, Mack-Blackwell Rural Transportation Center, \$14,417.03, "Development of Large-Scale Transportation Course," 2009-2010

Root, Sarah, Sam's Club/CELDi, \$45,000, "Improving Retail Logistics," 2009-2010

Root, Sarah and Russell Meller, Sam's Club/CELDi, \$61,500, "TITLE" 2010-2011

Root, Sarah and Chase Rainwater, Arkansas Electric Cooperative Corp., \$45,000, "Transportation Network Modeling," 2009-2010

Root, Sarah, Scott Mason, and Edward Pohl, and, National Science Foundation, \$72,837.00, "Collaborative Research,: Ensuring Continuity of Care: A Quantification of Risk in the Healthcare Supply Chain," 2009-2011

Rossetti, Manuel, National Science Foundation, \$40,000, "An Intermittent Demand Forecasting Tool," 2008-2010

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*



University Relations, University of Arkansas

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, the humanities and social sciences, engineering science, and engineering design in order to produce Industrial Engineers with the intellectual, technical, and professional competence to develop, implement and manage industrial engineering solutions to complex industrial, governmental and societal problems.

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/3536.php>

In the fall of 2010, 145 students were enrolled in our undergraduate program. The enrollment has increased slightly since the Freshman Engineering Program (FEP) was implemented three years earlier. The program continues to be directed by Dr. Richard Cassady of our department. The FEP provides a common academic foundation in engineering to all incoming freshmen before allowing them to major in a specific engineering discipline.

Highlights

The Department continues to maintain a modern, broad, and challenging undergraduate and graduate curriculum that supports the needs of industry and academia.

A logistics engineering emphasis area has recently been initiated. Students who are completing a BS in Industrial Engineering may now elect to complete an emphasis in logistics engineering. To complete this emphasis, students must complete 12 credit hours of relevant coursework that follow the requirements. The requirements for this emphasis include taking courses in transportation logistics and facility logistics. In addition, students may select courses in healthcare logistics,

manufacturing logistics, or business logistics.

Members of the class of 2010 were hired by nationally recognized companies such as Wal-Mart Inc., Exterran, Pratt and Whitney, J.B. Hunt, and Tyson Foods. This year's average starting salary was \$55,745. A number of students chose to remain at the University of Arkansas for studies in Industrial Engineering, Law, and Medicine.

The Department continues to report successes within professional societies and through personal achievements. This year the Alpha Pi Mu (APM) chapter received third place in the Outstanding Chapter competition by the APM Executive Council. Furthermore, graduate student Nabil Lehlou was the recipient of the APM National John L. Imhoff Scholarship. In addition, the Student Chapter of the Institute of Industrial Engineers (IIE) at the University of Arkansas received the Gold Award.

This year 22 IE students received various departmental and named scholarships. The total dollar value of these scholarships exceeded \$41,500, including \$38,000 provided by our distinguished alumni group, the Arkansas Academy of Industrial Engineering (AAIE).

Senior industrial engineering student Brittany Bogle received the prestigious National Science Foundation Graduate Research Fellowship and began graduate studies at Northwestern University in pursuit of a Ph.D. in industrial engineering.

Two industrial engineering students received scholarships from the Institute of Industrial Engineering, Maci Dickson received the IIE Presidents Scholarship and the College of Engineering Michael Joffe Scholarship and Ryan Black received the IIE A.O. Putnam Scholarship.

Finishing her year as Associated Student Government President, Mattie Bookhout was the recipient of the Senior Honor Citation Award from the Arkansas Alumni Association.

GRADUATE PROGRAM *Overview*



University Relations, University of Arkansas

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 below 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

Dr. 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

The University of Arkansas is the only institution in the state ranked in the first tier of national universities in America's Best Colleges. At the department-level we are pleased to report that in 2010 our graduate program was ranked 25th by *U.S. News & World Report*. During the reporting period, more than 594 students were enrolled in our graduate programs (27 Ph.D. students and 24 Master's students, as well as 543 students enrolled in the Operations Management graduate program). The students who entered our graduate program in the fall of 2010 had the following average GRE scores: MS 1269 and Ph.D. 1271.



Approximately 88% of all on-campus 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. Dr. Russell Meller has forged contacts with colleagues at more than ten universities in Latin America. Other faculty are building or maintaining relations with colleagues in China 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 2010 and published or presented their research in several major venues. Industrial Engineering

graduate students presented their work at the Industrial Engineering Research Conference, held in Cancún, Mexico in June; the ASEM Annual Conference, held in Rogers, Arkansas in October; and at the INFORMS Annual Meeting, held in Austin in November.

While pursuing his MSIE, Jeff Gwaltney has actively investigated the potential for rail transportation in rural communities. His work has resulted in new mathematical models to assist city planners in taking an integrated approach to developing a new light rail transit system. Jeff has demonstrated a strong interest in the application and implementation of his research by seeking out relationships with city planners, housing authorities and real estate experts in the Northwest Arkansas region. His efforts have been presented at both the 2010 Industrial Engineering Research Conference (IERC) and the 2010 Institute for Operations Research and Management Sciences Conference (INFORMS). His work led to funding from a 2010 Mack-Blackwell Rural Transportation Center grant.

The Material Handling Education Foundation awarded several scholarships to our top students: Zeynep Kirkizoglu received the \$3,000 Rack Manufacturers Honor Scholarship; Jennifer Pazour received the \$9,000 Ray Gibson Memorial Scholarship; and Lisa Thomas received the \$2,500 Rid-U-Rak Honor Scholarship.

Hugh Medal, Ph.D. student, was one of 20 nationwide selected to present their research at the Fourth Annual Department of Homeland Security Network Summit in Washington, D.C., where he represented our Mack-Blackwell Rural Transportation Center. Doctoral students Nabil Lehlou and Steve Sharp were selected to participate in RAND's Graduate Student Summer Associate Program.

Operations Management Master's Program

The Master of Science program in Operations Management, under the leadership of Dr. Edward Pohl, proceeded along dual trajectories of growth and continuous improvement as a hybrid, live and distance-learning degree program for working professionals from

Operations Management faculty from all program locations participated in the Plenary Faculty Meeting, August 2010.



Photo courtesy of Alex Mironoff

business/industry and the military. Course enrollments grew by 12% over 2009, and with 543 students attending in the fall semester of 2010, Operations Management continued to hold the distinction of being by far the largest graduate program in the University of Arkansas System. Since its inception in 1974, the program has graduated over 5,000 participants.

Several new courses were added to the curriculum in 2010 bringing the number of classes available to students of Operations Management to twenty-six. The latter include a Leadership course presented by Distinguished Professor and U of A Chancellor Emeritus John White with the participation of several corporate CEO's and other prominent members of the business community; a class in Linkages among Technology, Economics and Societal Values, presented by Professor Otto Loewer of the Biological and Agricultural Engineering faculty; and a Decision Support Application Development course, taught by Professor Scott Mason of Clemson University.

In addition to expanding the Operations Management curriculum, Dr. Pohl introduced a number of changes to admission and course requirements in 2010. The effect of these changes was to tighten admissions standards, to place all required courses at the front end of a student's

program of study, and to require higher grades in core courses as a precondition for continuing in the program. The changes take effect with the first fall term of 2011.

In August 2010, the Operations Management Program held a plenary faculty meeting which brought instructors from all program sites to Fayetteville for two days of discussions, updates and training. Faculty from the Fayetteville main campus, including Department Chair Dr. Kim Needy and Chancellor Emeritus John White, also participated in the meeting.

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 the acquisition of 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.

The independent study component of the program emphasizes action or applied research, rather than the formal research that is typical of most traditional graduate programs. Several specific paths through the course material are offered, providing concentrations in Industrial Management, Business Management, Human Resource Management, or Health & Safety Management. 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 Wal-Mart, Sam's Club, Tyson Foods, J.B. Hunt Transport, Fed Ex, Lockheed-Martin, and Pratt & Whitney.

In addition to evening classes, held on the U of A 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 www.msom.uark.edu.

“The Industrial Engineering Faculty is committed to providing a personalized undergraduate experience for their students. A soiree is held twice a year where faculty works alongside students to advise them on course study and provide professional development counseling.”

*Dr. Kim LaScola Needy
Department Head*



FACULTY SERVICE AND

Achievements

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. Manuel Rossetti, who was recently promoted to Professor, was named the Associate Department Head. Drs. Nebil Buyurgan and Chang S. Nam were promoted and tenured at the Associate Professor level.

Dr. Chang S. Nam was awarded the Faculty Early Career Development grant, also known as a CAREER award, from the National Science Foundation. His research work is intended to help visually impaired students study science. The CAREER award is one of the NSF's highest honors for young faculty members. It recognizes and supports junior faculty who are most likely to become the academic leaders of the 21st century. Recipients are selected based on high-quality research and the integration of that research with education initiatives in the context of the university's mission.

Dr. Russell D. Meller, Hefley Professor of Logistics and Entrepreneurship and director for the Center for Excellence in Logistics and Distribution (CELDi) received a National Science Foundation grant for his research to investigate ways to maximize efficiency in distribution and shipping centers. The grant will further establish the University of Arkansas-based center as the U.S. research leader on the emerging physical Internet initiative, which seeks to merge computing with modern transportation logistics to standardize shipping containers and share resources among companies.

Dr. Meller received the prestigious Reed-Apple Award

from the Material Handling Education Foundation for contributions to material handling education, research and service. The Reed-Apple Award was established to honor material handling education pioneers Jim Apple, Sr., of Georgia Tech and Rudy Reed of Purdue. Meller is only the 19th person to receive the award since it was created 30 years ago. Additionally, he was honored as the 2010 College of Engineering John L. Imhoff Outstanding Research Award recipient and received the Arkansas Academy of Industrial Engineering (AAIE) 2010 Faculty Member of the Year Award.

Dr. Meller received the IIE Transactions Best Applied Paper Award – "Aisle Configurations for Unit-Load Warehouses" at the IERC Honors and Awards Banquet in 2010. Dr. Meller and co-author Dr. Kevin Gue (Auburn) were awarded the Outstanding Research Paper published in IIE Transactions for the same research project.

At the Industrial Engineering Research Conference in 2010, **Dr. Chase Rainwater** and his co-authors received the IERC Best Paper Award in the Production Planning and Scheduling track. Their research focused on new interdiction techniques for combatting drug trafficking in the United States. This award has led to elevated visibility with Department of Homeland Security, as well as well-established researchers at University of Wisconsin and the Naval Postgraduate School.

Dr. Richard Cassidy received Fellow Status in the Society of Reliability Engineers (SRE) at the Reliability and Maintainability Symposium (RAMS) in San Jose in January 2010.

Dr. Ed Pohl, who serves as the Operations Management Program Director, was appointed as Distance Education Director for the College of Engineering. In addition, Dr. Pohl was Conference Chair for the 2010 American

Society for Engineering Management (ASEM) Conference. **Dr. Heather Nachtmann** and **Dr. Kim Needy** served as Program Co-Chairs and **Dr. Ernie Fant** was the Director of Tours. The national conference was hosted by the department in October 2010. Dr. Pohl also participated in the College of Engineering Study Abroad program in India.

Associate professors **Dr. Ed Pohl** and **Dr. Heather Nachtmann** 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 and in collaboration with the Health Industry Group Purchasing Association (HIGPA) and the Association for Healthcare Resources and Material Management (AHRMM) of the American Hospital Association (AHA).

Dr. Nachtmann is the current holder of the John L. Imhoff Chair in Industrial Engineering for a two-year period that began in January 2010. She is the third recipient to hold this title. Her goal is to make significant contributions in three key areas: service to students, teaching excellence, and faculty development.

Dr. Kim Needy, Department Head and 21st Century Professor of Industrial Engineering received her second Bernie Sarchet Award in two years. The award came from the American Society for Engineering Management (ASEM). It is the society's highest honor. She was previously recognized by the American Society for Engineering Education (ASEE) for a lifetime of achievement in engineering management education.

Dr. Needy actively participates in service activities through appointments on numerous committees in professional societies including the Council of Industrial Engineering Academic Department Heads (CIEADH) for the Institute of Industrial Engineers (IIE), American Society for Engineering Management (ASEM), Industrial Engineering Division of the American Society for Engineering Education (ASEE), Construction Industry Institute (CII), U of A Chancellor's Commission on

Women, and the Provost's Sustainability Committee. She was named Fellow in the Southeastern Conference Academic Consortium (SECAC) Academic Leadership Program (ALDP) for the 2010-2011 Academic Year.

Dr. Ronald L. Rardin, John and Mary Lib White Systems Integration Chair and Distinguished Professor of Industrial Engineering was recently honored as an INFORMS Fellow. The Institute for Operations Research and the Management Sciences (INFORMS) bestows its Fellow Award on members who have demonstrated lifetime achievement in operations research and the management sciences (OR/MS).

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. White recently published two textbooks, *Principles of Engineering Economic Analysis*, 5th edition (with K.E. Case and D.B. Pratt. 2009) and *Facilities Planning*, 4th edition (with J.A. Tompkins, Y.A. Bozer and J.M.A. Tanchoco, 2010).

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.

Dr. Steve Johnson is part of a research team collaborating with Virginia Tech Transportation Institute (VTTI) and the American Transportation Research Institute

(ATRI) that is influencing current National Highway Traffic Safety Administration (NHTSA) rule making and federal speed limit policies regarding the impact of speed limiters on commercial trucks.

Dr. Justin Chimka received the Outstanding Researcher award within the College of Engineering while **Dr. Manuel Rossetti** was chosen as recipient of the Outstanding Service to Students Award.

External Professional Service and Leadership

Buyurgan, N.

- Associate Editor, International Journal of RF Technologies

Cassady, C.R.

- Vice General Chair, Secretary of the Board of Directors, Annual Reliability and Maintainability Symposium
- Scholarship Trustee, Institute of Industrial Engineers
- Associate Editor, *Journal of Risk and Reliability*

Chimka, J.R.

- Council member, INFORMS Quality, Statistics and Reliability
- Session chair, INFORMS Quality, Statistics and Reliability
- Newsletter editor, INFORMS Quality, Statistics and Reliability
- Member, Editorial board, *International Journal of Quality Engineering & Technology*

Fant, E.W.

- 2010 Conference Tour Chair, American Society for Engineering Management

Johnson, S.L.

- Member, Board of Certification for Professional Ergonomists Exam Committee
- Member, Transportation Research Board Truck and Bus Safety Data Subcommittee
- Friend, Transportation Research Board Truck and Bus Safety Committee
- Friend, Transportation Research Board Truck Industry Research Committee (ATO60)

Milburn, A.B.

- Track Chair, 2011 Industrial Engineering Research Conference, Healthcare Systems Engineering

Meller, R.D.

- Education Liaison to Board of Governors, Material Handling Industry of America
- Department Editor, *IIE Transactions on Design & Manufacturing*
- Editorial Board Member, *Journal of Manufacturing Systems*
- Editorial Board Member, *Transportation Research Part E: Logistics and Transportation Review*
- Member, 2010 International Material Handling Research Colloquium Planning Committee
- Editorial Advisory Board for Material Handling & Logistics, 2010

Nachtmann, H.

- 2010 Conference Technical Program Co-Chair, American Society for Engineering Management
- Member, American Society for Engineering Education – National Engineering Economy Teaching Excellence Award Committee
- Member, Arkansas State Highway and Transportation Department's Advisory Council for Transportation Research
- Member, Academic Council for Healthcare Supply Chain Research
- Division Chair, American Society for Engineering Education – Engineering Economy Division
- Program Chair, American Society for Engineering Education – Engineering Economy Division
- Area Editor, *The Engineering Economist*

Nam, C.S.

- Editorial Board, *eMinds: International Journal on Human-Computer Interaction*
- Editorial Board, *The Journal of Information Technology Education*
- Member of Program Board, International Conference on Human-Computer Interaction
- International Program Committee, The IASTED International Conference on Human-Computer Interaction
- International Program Committee, The IASTED International Conference on Education and Technology

- Session Organizer and Chair, International Conference on Human-Computer Interaction
- Guest Editor-In-Chief, *International Journal of Human-Computer Interaction*

Needy, K.L.

- Member of the Council of Industrial Engineering Academic Department Heads for the Institute of Industrial Engineers
- New Faculty Colloquium Co-Chair for the Institute of Industrial Engineers
- At-Large Director of the American Society for Engineering Management
- 2010 Conference Technical Program Co-Chair, American Society for Engineering Management
- Book Editor, *The Engineering Economist*
- Associate Editor, *Engineering Management Journal*

Pohl, E.A.

- Associate Editor, *Journal of Risk and Reliability*
- Associate Editor, *The Journal of Military Operations Research*
- Awards Committee, Military Applications Section, INFORMS

- Vice General Chair, Reliability and Maintainability Symposium 2011

Rardin, R.L.

- Award Committee – Pritsker Dissertation Award, Institute of Industrial Engineers
- Associate Editor, *International Journal of Information Systems in the Service Sector*

Root, S.E.

- Media Coordinator for the INFORMS Junior Faculty Interest Group

Rossetti, M.D.

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

White, J.A.

- Chair, External Review Committee, Department of Integrated Systems Engineering at The Ohio State University
- Engineering Dean's Advisory Board at the University of Florida

RESEARCH & TEACHING LABORATORIES

Overview

Our research and teaching facilities continue to expand through the addition of new laboratories, as well as through procurement of additional equipment and enhancement of existing equipment in all our laboratories.

David D. and Nancy J. Foust Computation Laboratory

The David D. and Nancy J. Foust Computation Laboratory is a state-of-the-art, interactive teaching facility made possible by a generous donation by Mr. and Mrs. Foust in 2002. Students have 24-hour access to 30 workstations, all equipped with the latest software designed for the execution of Industrial Engineering projects. The lab is equipped with a plasma-screen display along with projection equipment to facilitate instruction, software demonstrations, and design presentations. There is also space within the lab for students to use when working on their design projects.



Operations Management faculty members utilize the Foust Computation Lab to attend training in the new release of Blackboard, the University's distance learning course distribution system, August 2010.

Photo courtesy of Alex Mironoff

Ergonomics Laboratory

The Ergonomics Laboratory supports both research and teaching in the field of ergonomics. The laboratory houses equipment used to measure the physical, physiological and psychological dimensions of human performance. The laboratory is used by both graduate and undergraduate students as part of the industrial engineering curriculum. In addition, both graduate and undergraduate students use the laboratory to conduct their thesis research.



A STISM driving simulator and an iViewX eye motion monitoring system were recently acquired for the laboratory. This equipment provides the opportunity to conduct research on a variety of topics related to improving the safety of driving both automobile and heavy trucks. The iViewX eye motion monitoring system has a variety of research applications such as the evaluation of driver distraction and workload when using different in-vehicle navigation configurations.

Larry and Gwen Stephens Undergraduate Research Laboratory

The Larry and Gwen Stephens Undergraduate Research Laboratory is a research facility made possible by a generous donation from Mr. and Mrs. Larry Stephens in 2006. It is designed to support the research projects of undergraduate students in the Industrial Engineering department. This initiative stems from the University's commitment to promote research at all academic levels.



The lab houses 27 undergraduate student researchers supported by their faculty advisors. Students engaged in research are assigned desk space in the lab for up to three regular semesters and issued laptop computers to aid in their investigations. Most of the student researchers attend classes together and have collaborated on class projects, which lends the lab a collegial atmosphere in which ideas and methods can be shared, tested and refined.

Human-Computer Interaction Laboratory

Dr. Chang S. Nam established the Human-Computer Interaction (HCI) Laboratory for the purpose of studying how individuals interact with complex information systems. The HCI lab is being used for both basic and applied research. Established research areas include new approaches to brain-computer interface (BCI),

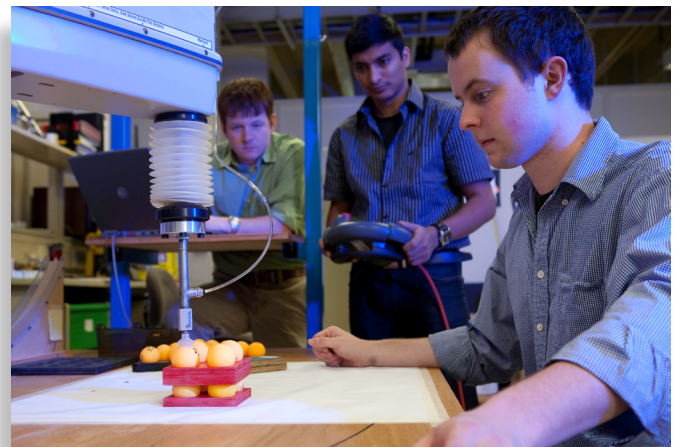


cognitive ergonomics, haptic audio virtual environments (HAVEs), adaptive and intelligent human-computer interaction, and ubiquitous computing. The lab is used

for instructional purposes in courses on the subjects of human information processing and human computer interaction, as well as in an advanced human factors course.

Manufacturing Automation Laboratory

The Manufacturing Automation Laboratory houses three new Adept robotic arms (a six-axis articulating arm, a two-axis linear module and a four-axis SCARA with a four-camera machine vision system), an IBM SCARA robotic arm/machine vision work cell with conveyor, and a new Southworth lift table. This equipment is used for both instructional and research purposes. Recently, Dr.



Earnest Fant combined the two-axis linear module with the six-axis articulating arm such that the latter could be carried in an inverted position to any location 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 six-axis articulating arm as the arm lowers itself to the project below. Machine vision can also be incorporated into the new work cell. The new Adept SCARA robotic arm with an Automated Temperature Measurement system and touch screen panel computer for system control has been modified so that other research and instructional projects can be performed by students.

There is a new stand-alone machine vision work cell with several new lighting sources and fixed, variable and telecentric optics for Cognex, PPT, and Banner

Engineering smart cameras to perform research and to introduce students to this technology.

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.

Renewable Energy Laboratory

The Renewable Energy Laboratory is designed to provide hands-on instruction and education to promote renewable energy application opportunities for residential, small business, farming, schools, and small communities in the State of Arkansas. The laboratory leads students through the process of designing and



installing grid-tie solar and wind power systems from the planning phase to working with the local utility to meet the requirements of net metering. Instruction concerning this laboratory covers the topics of Introduction to Photovoltaic, Planning of a Photovoltaic Array, Introduction to Enphase Micro-inverter, Installation of Enphase Micro-inverter, and Net Metering. The equipment featured is a 400 Watt Photovoltaic Array, 208VAC, 3 Phase (industrial use) with and an energy management unit to provide energy generation reporting to an off-site website.

ADVISORY BOARD

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 2010 Liaison Committee are:

- Melinda Faubel, AAIE President, Director of External Affairs, AT&T Arkansas
- Grant DuCote, AAIE President-Elect, Divisional Replenishment Manager, Wal-Mart Stores, Incorporated
- Dr. Alice E. Smith, Professor and Chair of the Industrial and Systems Engineering Department at Auburn University
- Gary Whicker, Senior Vice President Engineering Services, J.B. Hunt Transport, Inc.
- Lee Hartz, AAIE Past President, Director of Application Integration, Walgreens/Option Care Homecare



Members of the AAIE Liaison Committee with Department Head Dr. Kim LaScola Needy. Left to Right: Melinda Faubel, Grant DuCote, Dr. Needy, Dr. Alice Smith, Gary Whicker, Lee Hartz.

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.



Continuing A Mutual Commitment

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